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THE RHODESIA

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the Journal. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* Journal *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

The New Year.—In commencing this new volume we take the opportunity to wish all our readers a prosperous new year and to express the hope that the ensuing year will mark a period of substantial progress in the development of this great country. We would extend a welcome to the many new settlers who have come to this country since the signing of the armistice, and assure them, on behalf of the Department of Agriculture, of sympathetic assistance whenever practicable. Farming in a new country like Rhodesia is naturally attended with certain difficulties, but grit and perseverance are invariably rewarded. We perceive these qualities in the men who have recently come amongst us, and we feel sure they will make good.

We are pleased to record a substantial increase in the number of subscribers to the *Journal* during the past few months, and we hope to see that number added to in the coming year. We shall appreciate very much any efforts on the part of our readers towards that end.

With three exceptions all the members of the staff of the Department of Agriculture who went to the war have returned to duty. Of these three one is Lieut.-Col. Hope Carson, who was last heard of doing excellent work in Russia with the Tanks, for which he was decorated. It is worth while placing on record that of the male staff of 23 at the outbreak of hostilities 15 went on service.

Ensilage. So much has been written on this subject that we may be considered to be labouring the point in returning to it. However, the matter is of such importance that we feel reiteration to be necessary in order to secure wider recognition of the fact. We therefore draw special attention to the article written by Mr. J. A. T. Walters dealing with ensilage appearing in this issue and now available in bulletin form.

We have advocated repeatedly the advisability of accepting the making of ensilage as an essential part of the annual farming practice, and we would again emphasise the point. If further evidence were needed, the disastrous consequences of the recent drought in the Union and the wholesale devastation of grazing areas in this country by grass fires during the past dry season should be sufficient to bring home to stock-owners the vital necessity of taking measures to counteract such occurrences. The making of ensilage in this country is so simple a matter and its value so great that neglect of such a precaution is surprising. Even in years of short rainfall and in our least favoured districts it is possible to secure good crops of summer fodder. If stock-owners would but conserve such fodder in the form of ensilage and dry roughage, the occasional temporary drought we do experience would have little menace, and loss of grazing through veld fires would be less serious a matter than it now is.

It is a matter for comment that of a total of 516 pit and stack silos in the Territory, as shewn by the statistics published in this issue, less than half are in Matabeleland, which has a lower rainfall than has Mashonaland, and is more subject to prolonged spells of dry weather.

Rhodesian Grasses.—Many farmers and others hold the opinion that we have in this country native grasses quite equal in value to any of the foreign grasses which have been introduced or are in course of being tried. Whether this is so or not remains to be proved, but it is obvious that every effort to discover the properties of the native pasture plants is work for the good of the country and should be encouraged.

It will therefore interest readers to know that Mr. F. Eyles, F.L.S., the well-known collector, whose Record of Plants collected in Southern Rhodesia was recently published in the transactions of the Royal Society of South Africa, is engaged in an attempt to bring together as complete a collection of dried Rhodesian grasses as possible. As is generally known, similar work has been receiving the attention of the Department of Agriculture for some years, and at the present time a considerable number of the most promising native grasses thus far known are being grown experimentally at the agricultural experiment station, Salisbury. The feeding value and grazing qualities of these grasses are being studied, and the collection is frequently being added to.

We welcome Mr. Eyles' effort, and are informed by him that he has already seventeen collectors working with him in various districts from the Victoria Falls to Umtali, and hopes to add to this number.

Two private individuals, whose names are not disclosed, have offered prizes for the best collections sent in, as follows:—A prize of £4 4s., open for everyone, and two prizes of £2 2s. and £1 1s., open only to school children. The Director of Education has taken the matter up heartily, and has arranged a grass collecting competition for the scholars, boys and girls, of every school in Rhodesia, whether public, aided or private.

We understand that Mr. Eyles intends to put a selected type set of specimens on permanent exhibit at the Queen Victoria Memorial Museum, Salisbury, and that endeavours are being made for a similar set to be placed in the Bulawayo Museum.

Tobacco.—The price of Virginia tobacco has increased considerably during the past year. This has been caused by the increase in the cost of production and the ever-increasing consumption. The Rhodesian Tobacco Co-operative Society last season entered into contracts with the United Tobacco Company and Mr. Pevsner, of Bulawayo, for the sale of leaf received by the society for a period of three years. The prices at the time the contracts were entered into were considered to be excellent, and the tobacco growers were assured of a market for their produce.

On account of the increased cost of production in Rhodesia and the effect of the preferential rate of duty on colonial grown tobacco entering the United Kingdom, the United Tobacco Company and Mr. Pevsner have agreed to give members of the society a bonus of 20 per cent. on the value of all standard grades of tobacco and 10 per cent. on the value of all intermediate grades of tobacco purchased by them. This concession on the part of the buyers is considered most liberal in view of the fact that their contracts were for a fixed period at definite prices, and it should do much to stimulate the production of tobacco in Southern Rhodesia.

As the bonuses only apply to the recognised standard and intermediate grades of tobacco and not to inferior leaf, it is expected that growers will use every care in growing, curing and handling their crops.

Cave Guano Deposits.—In view of the recent discovery of large deposits of cave guano in this Territory, information regarding the composition of the guano will be of interest. In 38 samples analysed in the Agricultural Laboratory, Salisbury, the average percentage amounts of the fertilising ingredients—nitrogen, phosphoric oxide and potash—were as follows:—

Total nitrogen, 3.9 per cent.
Total phosphoric oxide, 9.7 per cent.
Total potash, 1.1 per cent.

The following analyses of four of the 38 samples referred to indicate the wide variation in the composition of cave guano deposits:—

Nitrogen per cent.	Phosphoric Oxide per cent.	Potash per cent.
0.17	5.35	0.24
11.37	3.60	1.16
1.59	31.32	—
4.02	1.49	0.24

Although the samples differ greatly in composition, Mr. Blackshaw, the Agricultural Chemist, is of the opinion that the nitrogen, phosphoric oxide and potash have been derived from the excreta and remains of bats.

The Salisbury Show.—It has been decided to hold the annual show of the Rhodesian Agricultural and Horticultural Society on the 11th, 12th and 13th of August. The prize list is now being prepared, and it is hoped to be able to place it in the hands of prospective exhibitors by the middle of February. With the general increase in the number of farmers and the scale of farming operations throughout Mashonaland, the executive committee of the Society are making every effort to widen its activities and increase its usefulness.

The maize exhibits are to be made a special feature, and it is proposed to offer more substantial prizes for dairy cattle and pigs. A new departure will be the housing of the butter, preserves and bacon section, the vegetable section, and the needlework and woodwork sections in the women's industrial hall, which it is intended to build in time for the show. A strong committee has been appointed, in which women form a majority, to handle these very important sections.

A sum of nearly £800 has already been raised for the building of the industrial hall by the holding of a bazaar in Salisbury during December. The Society is confronted with the prospect of heavy expenditure in wiping out the old debt, in the construction of further buildings to meet the ever-growing demand of exhibitors and in making the show in all respects thoroughly representative of the pastoral and agricultural activities of the Province.

The Maize Association.—A general meeting of the association was held on 20th December, when the main item of discussion was the schedule in the maize section of the Rhodesia Agricultural and Horticultural Society. It was agreed to suggest to the society and the Farmers' Co-operative Society that for the large classes of 8, 10, 12 and 14 row maize cobs only should be demanded, and that 500 cobs should be the number in each class. A long discussion took place as to the conditions under which bags of maize should be exhibited. The general idea was that some class should be instituted which would be a test of a farmer's general crop, and the proposal was made that a committee should select at random five bags of maize from the crop of any intending competitor after it had passed the grader. The practical difficulties in carrying out this idea were rather formidable, and the matter was dropped for the time being. There is scope for the ingenuity of any maize grower to devise a scheme to meet the problem. It was recommended ultimately that the four classes in the bag exhibits should remain as last year, namely, one bag of 200 lbs. with 10 cobs of the same variety. The 10 cob classes and single cob classes for the four different kinds of maize were recommended to stand. The experiments with maize being carried out by the Department of Agriculture were announced in detail, and it was strongly urged that the members of the association should visit the experiment station at various stages of the growth of the plants for their own instruction and observation.

A committee, consisting of Messrs. G. Duthie (president), Newmarch and Pascoe, were appointed to visit the station with a view to making a report on the experiments on behalf of the association. These reports could only be of a general nature, since the Agricultural Department would naturally publish the numerical and statistical details later. The important questions of recognition of judges and examination of candidates were deferred to a later meeting, as was also the question of the recognition of growers of reliable seed.

Poisoned Bait for Maize Pests.—During the present season a certain amount of money and labour has been wasted by the use of bait made with arsenite of soda and molasses on black soils against the maize beetle (*Heteronychus mashunus*) and the common cutworm. The maize beetle feeds underground, and so far all endeavours both in Southern Rhodesia and in the Union to kill it or its close relatives with a poisoned bait broadcasted on the surface have failed entirely (*Rhodesia Agricultural Journal,* Feb., 1918). It was also clearly pointed out in the *Agricultural Journal* for August, 1918, that the common cutworm

(*Euroa segetis*) dislikes and rejects bait made with arsenite of soda, though successful results can be obtained by using Paris green instead.

At the same time further field experiments carried out during the present season with the arsenite of soda bait on red soils against the pests *for which it is recommended*, viz., surface beetles, snout beetles and crickets, have been very successful and have confirmed our previous results. There should be no reason for any confusion between the maize beetles and the surface and snout beetles, since the maize beetle is a bulky insect about half an inch or more in length and shining black in colour. It breeds mainly in *wet* black lands, and attacks the plant one or two inches below ground. Surface and snout beetles are only half the size; the former being a dull black, often hidden by a coating of dust; the latter are light brown and feed only on the leaves of the plants.

Mexican Marigold (*Tagetes minuta*).—In view of the rapid spread which this weed is capable of making it will not be out of place to remind farmers of the necessity for a special campaign against this pest where it occurs. Not a few farmers are already waging war by detailing one or more "boys" to traverse the farm continually and hoe out the plants before they can seed, and the Salisbury Municipality is making a similar effort throughout the municipal area. The old adage that one year's seeding spells seven years' weeding applies with particular force to Mexican marigold, and to check the spread of this plant nothing less than a combined effort is necessary. The work of the careful farmer who cleans his land is often nullified by the careless neighbour who neglects to do so. Mexican marigold has not yet secured so firm a grip in this country that its further spread cannot be checked if all landowners will but combine against it.

Where practicable seeding can be checked by mowing, but where this is not possible, as for instance on ant heaps in the veld, the plants can be cut by hand or hoed out and the grazing improved by planting in its place Kikuyu grass or ordinary couch grass. The thorough cultivation of land under crop, or the ploughing under of the weed before seeding, or resting land will check its spread in our arable lands.

Sunflower Seed. A sample of black sunflower seed grown in this country was sent to London in October last year by the Department of Agriculture, in order to ascertain its marketable quality. A reply has been received from the Produce Brokers Co., Ltd., stating that the seed is of good quality and is valued at anything between £50 and £55 per ton. The opinion is expressed that if this seed were offered in large quantities considerable business could be done. As to whether the production and export overseas of sunflower seed at the present time is a profitable undertaking of course depends on railway rates and shipping freights, but it would appear that an average yield of from 500 to 700 lbs. of seed per acre would return a good profit.

Forest Officer.—Mr. J. S. Henkel, who has been appointed Forest Officer to the Department of Agriculture, has taken up his duties, and may be consulted upon all matters connected with afforestation, such as the conservation of indigenous forests, the establishment and care of plantations or the use of timber. Prior to coming to Rhodesia Mr. Henkel held the appointment of Conservator of Forests for Natal, and at one time was principal lecturer in forestry at the South African School of Forestry, Capetown. Afforestation is a matter of the utmost importance to Rhodesia, and we hope to be able to afford it suitable recognition in the pages of this *Journal* in future. We have pleasure in publishing in this issue an article by Mr. Henkel dealing with afforestation in Zululand which we think will be read with interest.

Ensilage.

By J. A. T. Walters, B.A., Assistant Agriculturist.

With the growth of the cattle industry in Rhodesia the necessity for providing winter fodder has become increasingly evident, and whereas some years ago such provision was confined to the cutting of a quantity of veld hay somewhat late in the season, the latest statistical returns shew that there are now over 12,000 acres to fodder crops other than maize, besides over 6,000 acres to maize for ensilage, while the total number of silos—pit or stack—in the country is close upon 600. It is therefore obvious that the necessity for the provision of winter fodder is being realised, and with it the need for making *succulence* an essential feature of the feed for cattle during the dry season. Attempts to provide the necessary succulents have taken the form of growing mangels, pumpkins and melons, and of improving the veld by the promotion of grasses that keep green largely through the winter. No method, however, has been more satisfactory and economical for this purpose than the preparation of ensilage, for the reason that the material for this purpose is so abundant in the summer months and the resultant foodstuff is so palatable and beneficial to stock.

The principal value of ensilage in the economy of farming lies in the fact that it represents an attempt to store summer feed for use during the winter months, and thus tends to even up the feeding conditions for the whole year. The long period of winter drought in Rhodesia would form a serious obstacle to stock rearing were such a provision not possible. Maize, grasses and legumes, when conserved in the silo, lose very little of their original succulence and palatability, and there is practically no loss in weight. Ensilage, therefore, provides an almost ideal method of storage.

Ensilage may be defined as green fodder which has been conserved in an air-tight pit or silo, or even in an open stack, and which has undergone a certain amount of fermentation in the course of storage. As is well known, heat is produced when green fodder is packed, and the whole art of ensilage-making may be said to consist in the regulation of this heat so as to prevent decomposition or rotting, but to allow a certain amount of fermentation to take place. This fermentation is responsible for the peculiar odour that ensilage possesses. Even in the making of ordinary hay a certain amount of fermentation is necessary, which is one of the reasons why it should be cut as early in the season as is possible, if it is to contain the full properties that characterise good hay.

The material for ensilage is abundant in Rhodesia, and as wet weather is no hindrance, it can be cut at any time it is ready. Ordinary veld grass may be used, while kaffir corn, Napier fodder, Indian cane, velvet beans, Kudzu bean, cowpeas, dhal tops, lucerne, Sudan or teff grass (in the green stage) are all excellent for the purpose. The best single material, however, is undoubtedly *maize*, and when cut at the proper time, it is unequalled for the purpose. Careful estimates shew that the *best period at which to cut* any fodder destined for ensilage is that at which it contains approximately 75 per cent. water and 25 per cent of dry matter. Analyses of the maize plant at different stages of its growth are shewn in the following table, and the weights per acre have been adapted to average Rhodesian conditions:—

Period of growth.	Water per acre.	Dry matter per acre.	Percentage of water.
Date of tasselling	10,000 lbs.	1,100 lbs.	90 per cent.
3 weeks later	17,500 ,,	2,900 ,,	85 ,,
5-6 weeks later	15,600 ,,	4,500 ,,	77 ,,
8-9 weeks later (crop ripe) ...	12,500 ,,	5,000 ,,	71 ,,

From these figures it will be seen that the proper time for cutting maize for ensilage is about the *fifth or sixth week after flowering.* If the farmer therefore notes the period his ensilage mealies are in flower, he will know when to cut with the greatest advantage. If this date has not been noted, the right time can be told from the cobs, which should be well over the milky stage and shewing the indentations plainly. The lowest leaves of the plant will also be turning brown at this period.

It is undoubtedly an advantage in the preparation of ensilage to utilise more than one crop, and if possible to include a leguminous crop, with a view to adjusting the *nutritive ratio* of the ensilage, or in other words to improve the "balance" of the material. The *velvet bean* is an excellent crop for this purpose, and can be grown either separately, or better still in among the maize intended for ensilage. Being a climber it will utilise the maize plants as a support, and as it is a slow grower it should be planted from 10 to 14 days before the maize, the mealies being planted subsequently in or near the same rows as the beans. Plate I. shews a stand of maize and velvet beans grown under these conditions. Other legumes such as lucerne, cowpeas, peanut tops or dhal may be used, and are preferably cut in the flowering stage.

Another plant recommended by American writers for inclusion in the constituents of the ensilage pit is the *sunflower*, the heads only being used. If the crop is sown at the same time as the maize, the heads will then be ready for cutting at the required time. The quantity recommended is one acre of sunflower for every four acres of maize, the sunflowers being sown separately. These three constituents—one grass crop, such as maize, one leguminous crop, such as velvet bean, and one oil crop, such as sunflowers, in the proportions specified—are calculated to give an almost ideal ensilage, containing the requisite quantities of carbohydrates, protein and fat respectively for a balanced ration. The farmers' *diary for ensilage* would therefore appear as follows:—

First week of January—velvet beans sown for ensilage in rows 3 ft. apart.
Second week of January—one quarter the above acreage to sunflowers.
Third week of January—maize sown among the velvet beans or planted separately.
End of March—first tasselling observed in the maize.
First week of May—cutting and pitting ensilage.

Heating and fermentation set in as soon as the material is cut and put in the pit, and the degree and nature of the fermentation depend upon the amount of heat evolved; the farmer therefore controls his ensilage by controlling the heat. Thus if the pit is filled slowly and the stuff is not well tramped great heat will be produced and decomposition or rotting may set in. This is due to the fact that the oxygen in the air produces combustion. If the material is packed tightly by tramping, and the pit filled a little more quickly, less heat will be evolved in proportion as the air is excluded. In this way fermentation can be controlled and decomposition prevented. The ideal *temperature* for ensilage-making ranges between 120 to 160 degrees (Fahrenheit). If the temperature exceeds 160 degrees it becomes blackened or burnt and may be useless. Within this range, however, a variety of qualities may be obtained, for the reason that different bacteria are promoted at the different temperatures. At the lower temperatures organisms producing lactic and acetic acids are active, resulting in *sour* ensilage; at the higher temperatures other bacteria form products resembling alcohol, which gives *sweet* ensilage its characteristic fruity or vinous smell. These different degrees may be stated as follows:—

Under 120 degrees—sour ensilage.
120 degrees to 130 degrees—slightly acid.
130 degrees to 140 degrees—sweet green silage.
140 degrees to 160 degrees—sweet brown silage.
Over 160 degrees—burnt.

The best ensilage is made at about 130 degrees, and is neither sweet nor sour, but it should be remembered that sour silage keeps better than sweet after the pit is opened. Ensilage should not be fed until fermentation has entirely ceased, *i.e.*, not for about 6 to 8 weeks after the pit has been closed.

Method of Filling.—In filling the ensilage pit or silo, from four to six feet are filled in at a time and pressed down as firmly as possible. Care is required to ensure that the stuff at the sides is well tramped. The centre can be left to look after itself. The rise in temperature will occur almost immediately, and may be tested by plunging the hand into the heap or by using a thermometer, inserting it about two feet below the surface. In actual practice it may be assumed that if the fodder is cut at the right time and filled in at the rate of *four to six feet per day*, good ensilage will result. If it is thought that the temperature

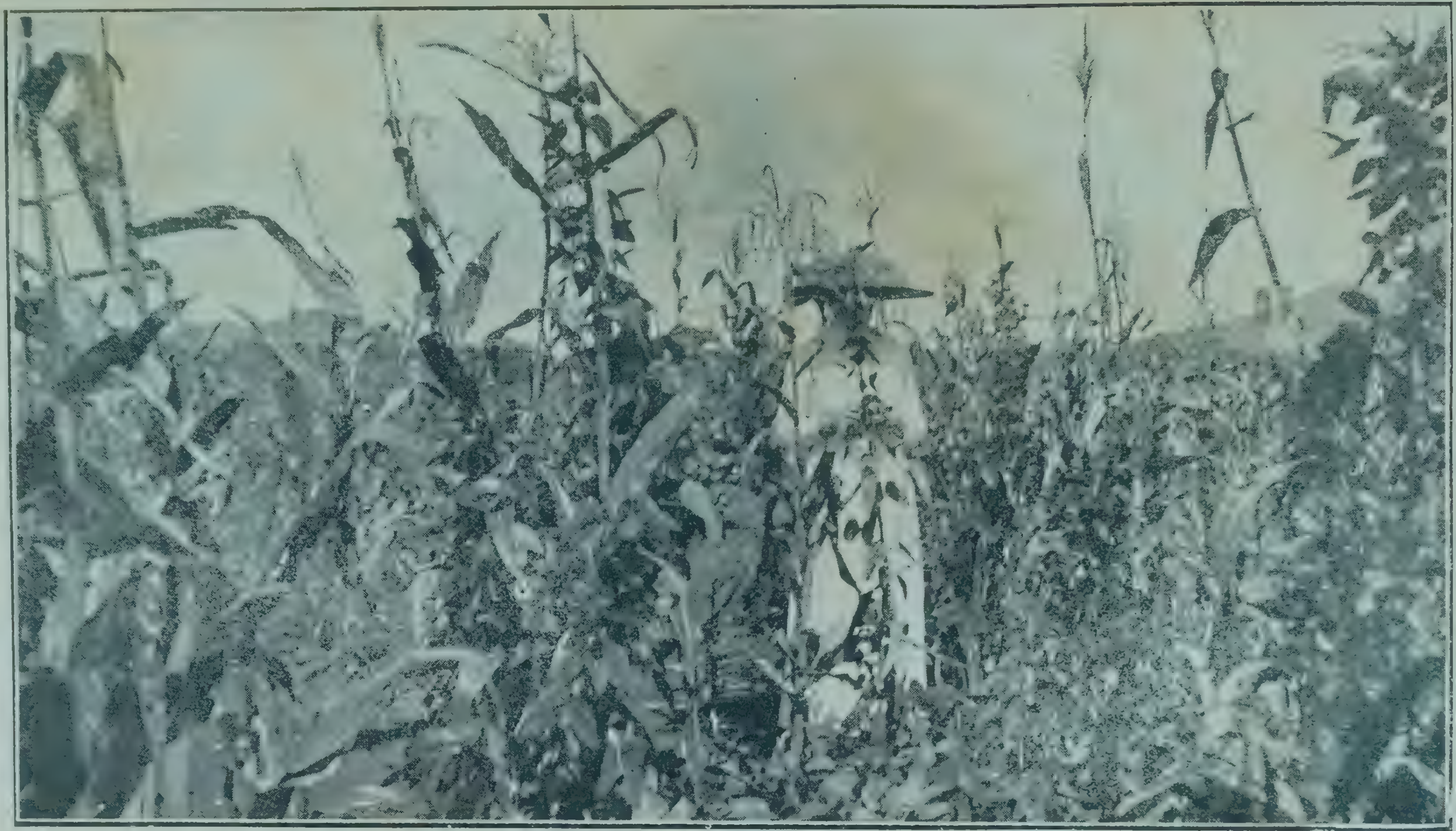


Plate I.
Maize and velvet beans.

often met with in South Africa. It is the simplest method of all of conserving ensilage, but is the least economical. This method consists of storing green fodder above ground, as is done with hay, in the form of a stack (see Plate IV.), and its effectiveness lies in the fact that the mould which forms on the outside and penetrates to a depth of a foot or two constitutes an air-tight cover which prevents further decay. Chaffing is not practicable in this case, and whole maize stalks are generally used. It is necessary also to weight the stack well with stones or timber placed on top. Such stacks should be as big as is convenient in order to avoid waste, and when opened should be fed rapidly. They should also be erected some distance away from the homestead, as the odour is liable to be overpowering.

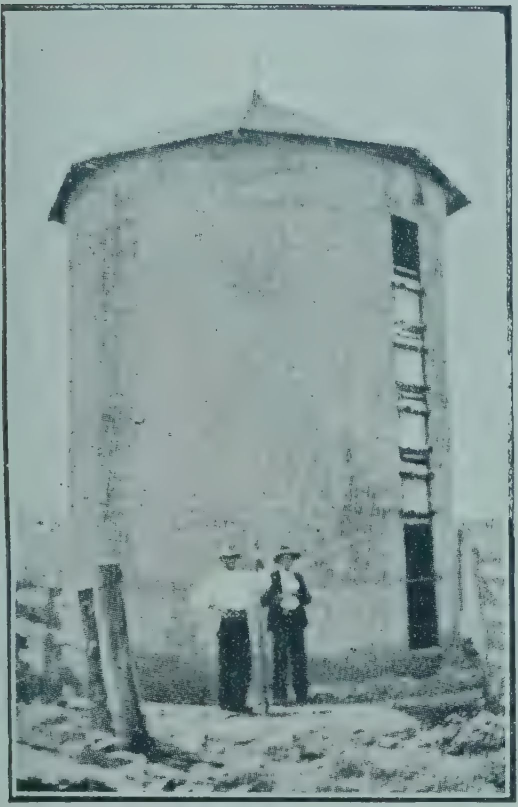
Value of Ensilage.—As to the value of ensilage in itself and its advantage when compared with the same fodder in other forms there is no doubt whatever. The cost per acre of producing ensilage in the Transvaal is given by Mr. Burtt-Davy (quoting Holm) in his book on "Maize" as follows:—

Ploughing, cultivation, seed and seeding	£1 15 0
Cutting and hauling to silo	1 15 0
Chaffing and pitting	1 10 0
	£5 0 0

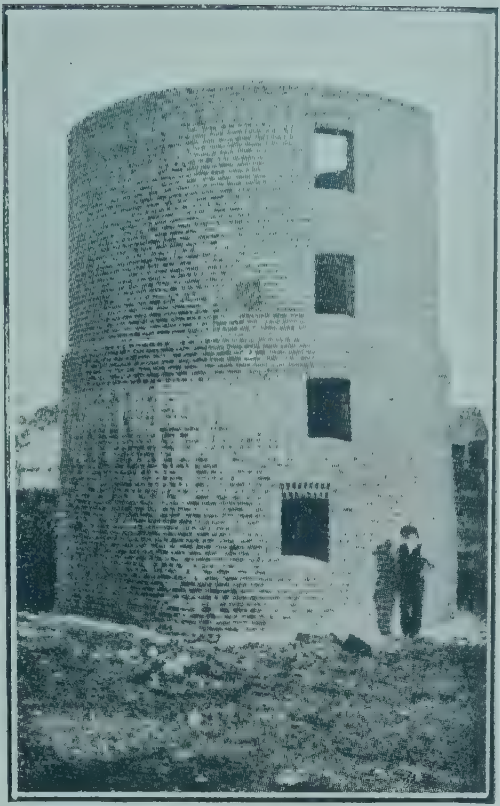
This estimate of cost is in my opinion high for Rhodesia, but assuming a return of seven tons of ensilage which cannot be valued at less than £2 per ton, we have a very substantial profit per acre.

Analyses of ensilage will of course vary according to the material used. On an average, maize ensilage will contain about 75 per cent. water, 2 per cent. protein, 12 per cent. carbohydrates, 1 per cent. fat, 8 per cent. fibre and 2 per cent. ash. The addition of leguminous crops will improve the "balance" by increasing the total amount of protein present, or again the "balance" may be restored by including feeds like oil cake, velvet bean hay, lucerne, or beans in the daily ration of the animals. A point of greater interest in connection with silage is its *digestibility*. The total amount of digestible matter in any foodstuff is usually computed as the difference between the fodder fed and the solid excrements of the animal. There would seem to be no doubt that ensiling a crop maintains its digestibility as no other process of storage does. The annual report of the Ontario Experiment Station gives the result of an experiment to test the percentage of digestibility of maize ensilage as follows:—Protein 55 per cent., fat 61 per cent., carbohydrates 74 per cent. and crude fibre 74 per cent. In the "Feeding of Animals" (Jordan) the digestibility of dried maize fodder is given as 70.7 out of every 100 parts of organic matter, while ensilage made out of similar material gave an average of 73.6 digested. Maize stalks allowed to stand in the field after maturity shew at the end of two months a loss of about one-half in the dry matter they contain, and more than one-half of the feeding value.

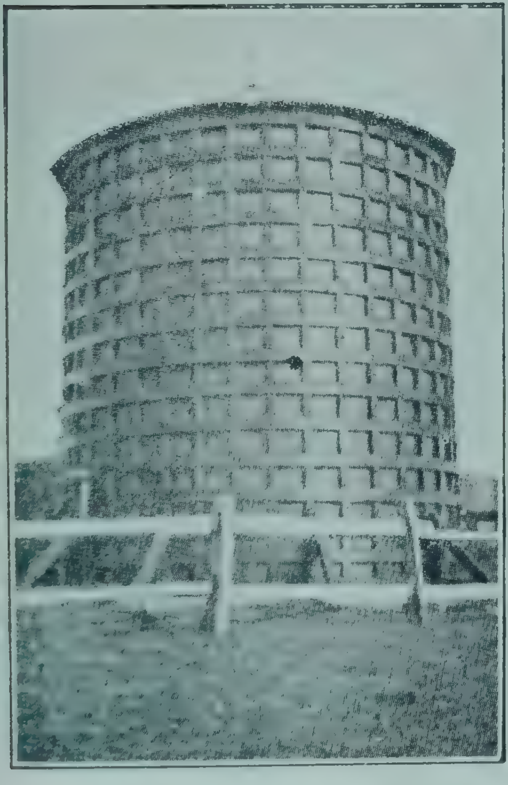
Feeding of Ensilage.—The rate at which ensilage can be most profitably fed to animals has been the subject of considerable experiment,



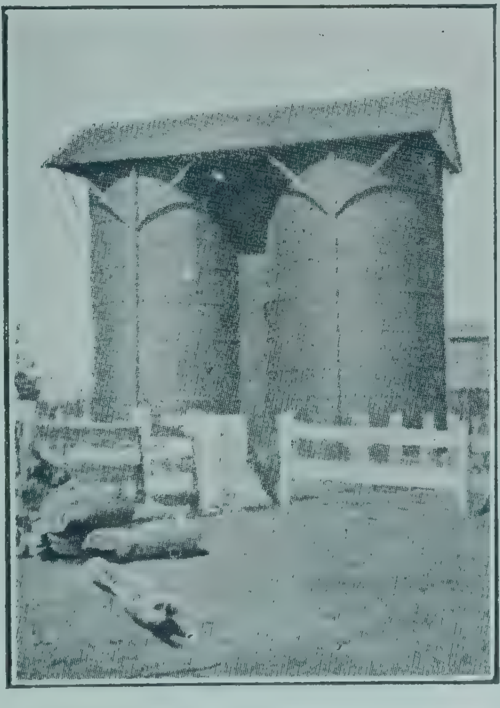
Ferro-cement silo.



Brick silo.



Wood and iron silo.



Twin tub silos.

Plate III.

(From Farmers' Bulletin No. 6, Dept. of Agriculture, New South Wales.)

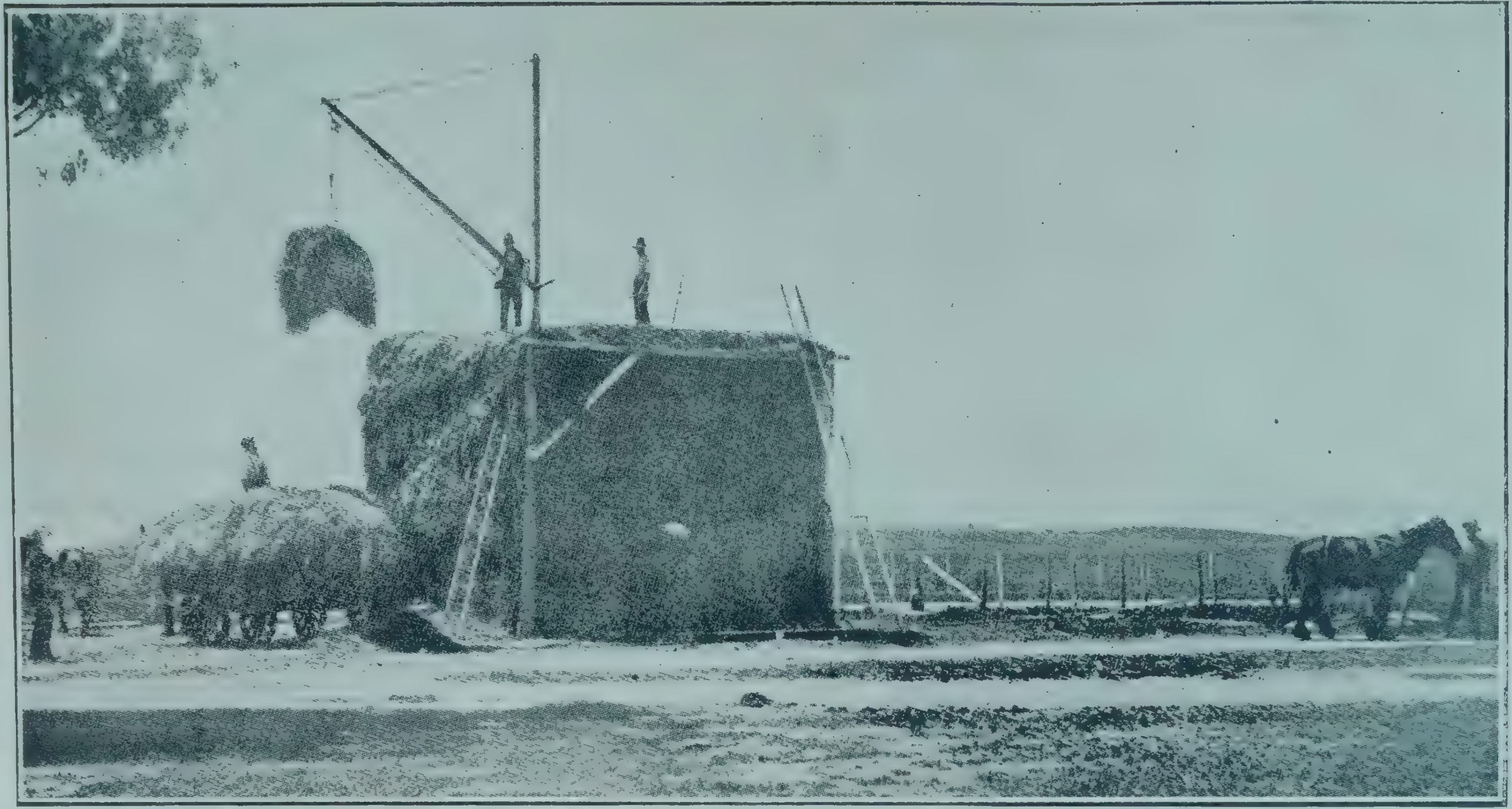


Plate IV.
Building a stack of silage.
(From Farmers' Bulletin No. 6, Dept. of Agriculture, New South Wales.)

and most experimentalists are agreed in placing the quantity at about 30 lbs. per day for dairy animals, a little more to beef animals, and from 15 lbs. to 20 lbs. a day for horses and mules. It can also be fed with advantage to sheep, and even to poultry. It has a slightly laxative effect when fed in large quantities, but this is not apparent when used in addition to dry feed. Silage is said to taint milk, but this is due to the fact that milk very readily absorbs odours, and if the silage is fed after milking, and the milk is kept from coming into contact with the silage no danger need be apprehended. Its beneficial effect upon the milk supply is very striking, and trials have shewn that only one feed—mangels—gives better results in this respect.

A matter of great importance to the farmer is an estimate of the acreage of fodder that has to be grown for ensilage in order to feed a given number of cattle for a given number of weeks. The following formulas will enable the farmer to gauge both the acreage he will require to grow and the size of the pit or silo he will require to construct:—

1. The quantity of ensilage recommended to be fed is about 30 lbs. per day per beast.

2. An acre of maize or maize and velvet beans yields about eight tons at the time of cutting. This will produce about seven tons of ensilage.

3. Ensilage shrinks to about five-sixths its original size in the course of a few weeks' time. In the following formulas and tables the size given for the pit has been increased to allow for this fact.

4. Multiply the number of cows by the number of weeks to be fed and divide by sixty-six. This will give the number of acres to be put under maize for ensilage. Example: 15 cows or oxen require to be provided with ensilage for 17 weeks, 15 x 17 equals 255; divided by 66 equals 3¾, say 4 acres.

5. Size of pit. For every ton of ensilage allow 80 cubic feet. For every acre of ensilage maize allow 560 cubic feet.

6. Conversely, if the pit has been dug, it will store one ton of ensilage for every 80 cubic feet, and for every 560 cubic feet one acre of maize must be grown to fill it.

7. The following tables will save the farmer the trouble of working out formulas:—

No. of cows to be fed for 4 months (17 weeks).	Quantity (in tons) of silage required.	Cubic content of silo or pit required.	Acreage of maize needed.
6	11 tons	880 cubic feet	1½ acres
9	16½ ,,	1,320 ,,	2½ ,,
15	27 ,,	2,160 ,,	4 ,,
20	36 ,,	2,880 ,,	5 ,,
25	45 ,,	3,600 ,,	6½ ,,
32	58 ,,	4,640 ,,	8½ ,,
72	130 ,,	10,400 ,,	19 ,,
100	180 ,,	14,400 ,,	26 ,,

If the pit has been dug:—

Size of pit.	Quantity of silage it will hold.	Acreage of maize required to fill it.	No. of cattle it will feed for one month.
400 cubic feet	5 tons	¾ acre	11
700 ,,	9 ,,	1½ ,,	20
1,000 ,,	12½ ,,	2 ,,	27
1,500 ,,	19 ,,	3 ,,	42
2,500 ,,	31 ,,	4½ ,,	69
4,000 ,,	50 ,,	7 ,,	111
10,000 ,,	125 ,,	18 ,,	276

The above figures for the *acreage* necessary for the maintenance of a given number of cattle or to fill a certain size of pit will vary slightly according to locality. In districts like Mazoe or on rich lands generally, a slightly lower acreage will suffice; on sand veld or poor land the figures should be a little higher.

The complaint once frequently heard, that cattle refuse to eat ensilage, is no longer heard now that ensilage is correctly made and is in general use everywhere. A series of articles dealing with the theory and practice of feeding cattle in Southern Rhodesia commenced in the August issue of this *Journal*, and should be carefully read by all farmers who are feeding ensilage.

Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia.

By R. C. Simmons.

PART IV.

For Milk Production.—It is a matter of common knowledge that an ordinary native cow, running all the year round on the veld without any supplementary feed, will give a few bottles of milk per diem of rich fat content or just about enough to maintain the normal growth of her calf until it is fit to wean. Such a cow would appear to know instinctively that she is entirely dependent on the veld for her maintenance, and ceases to give milk as soon as her calf can be weaned, so that she may utilise all the restricted supply of food which she obtains in winter for the maintenance of her own body and the development of her next unborn calf. Cows of recognised dairy type are animals in which the qualities of maternity (which include milk production) have been so highly developed by long selection and feeding by man that they continue to produce milk in as large quantities and for as long as possible irrespective of their own present or future bodily requirements. Concurrently with the development of this tendency the ability to consume large quantities of food and to turn the same into milk has also been developed, and has become, in a greater or lesser degree, inherent. As an illustration of the opposite effect on the nature of cattle of continued feeding and selection we know that many individuals of the highly developed beef breeds have so deteriorated in milk production that foster mothers are required to rear their calves.

In this country dairying is carried on with various classes of cows, from those that have just a cross or so of dairy blood in them to what are known as high grade dairy stock, up to, in some instances, pure-bred dairy cows or cows bred entirely from first-class milking stock. On the average the milking capacity of these various classes will be proportionate to the amount of dairy blood in their composition, although exceptions do occur, and a great milker is sometimes found amongst common cows. The three classes may be regarded literally as simple, more elaborate and highly developed types of machines for the production of milk from farm foods. In neither case is it reasonable to expect the machine to give economic production unless raw material, in the shape of farm foods, is supplied of the right quality and quantity to keep the machine in repair and enable it to keep working during the whole 24 hours. It is obviously as unwise to supply more material than the machine can deal with and is therefore obliged to discard (unless it be very cheap) as to supply too little.

The farmer who seriously contemplates dairying will purchase heifers or cows having at least two or three crosses of good dairy blood in them, and will endeavour constantly to improve his herd by the purchase of better animals as funds and opportunity permit and by the use of good dairy bulls. After a time it is probable that some of the cows of his original herd will be found to be inferior milkers. These should be discarded as soon as possible and replaced with better animals. The true merits of the herd can only be ascertained by feeding them all well to commence with, so that they may have a chance to do their best. The ultimate quality and quantity of the rations will be decided by the amount each cow or group of similar cows will pay for in milk products. The fact should never be lost sight of that a moderate milker may pay for a good supply of cheap rations and may be quite worth while farming with in the absence of capital wherewith to purchase a better animal, or before one is prepared to provide the necessary detailed attention and more expensive rations required in order to realise the full profit on higher class stock.

In Rhodesia, in the past, the great drawback to dairying has been the want of proper organisation of the trade in dairy products. The recent amalgamation of the various conflicting interests which has taken place would appear to leave the ground, as it were, clear for the producer to set to work in earnest and with confidence that he will reap a fair return for his labour and capital expenditure.

The production of milk is essentially a nervous function, and in the selection of dairy animals one should look for those outward signs which denote a highly organised but controlled nervous development, in contradistinction to the stolid, rather phlegmatic disposition desirable in a beef animal. A strong constitution is of paramount importance, and it is denoted by a large open nostril, strong muzzle, depth and width of chest and heart girth, well sprung ribs, and a general appearance of thrift. A well-bred Jersey cow represents, probably more nearly than any other breed, perfect dairy conformation. Dairy cows of other breeds and cross-bred dairy cows have this conformation, albeit it is sometimes much modified. The general tendency will be to present (1) a rather long clean cut head, slightly dished, narrower between the eyes than beef cows, with active, thin ears and a bright, mild, intelligent eye; (2) the neck joining abruptly with the head and shoulders, muscular rather than fleshy; (3) shoulders fine, sloping, and narrow on top; (4) ribs well sprung and sloping rather backwards; (5) spinal cord strong, prominent and high over pelvic arch; (6) good length between hips and pin bones; (7) thighs long, and having a concave appearance from whichever side they are viewed; (8) a well formed udder, the soft skin of which should reach well forward and up behind; (9) skin soft and pliable, and covered with fine hair; (10) limbs strong but fine. Many other points could be enumerated, but the foregoing will serve in selecting ordinary cross-bred cows and heifers in which the more subtle dairy qualities are not very apparent. It will be an advantage as a rule if cows can be selected from herds of known good milking qualities and if they are sired by the son of a known good milch cow.

Elaborate and expensive feeding arrangements, however desirable, are by no means essential. Efficient buildings and mangers may be constructed very cheaply (see Bulletin No. 243, obtainable on application to the Director of Agriculture). The great thing to remember is that anything which conduces to the comfort of the cow and protects her from cold rain and winds, excessive heat, flies, or over-exertion, is likely to stimulate the milk flow, whereas discomfort and annoyance will tend to decrease it, not only in quantity, but in quality. While it is undesirable to have dairy stock over-fed at any time of their lives, they should be maintained in good strong healthful condition at all times. The ox may experience a season of scarcity without suffering permanent harm, but it is not so with the dairy cow, since either her growth, her calf, or her milk production is bound to suffer to some extent permanently. Although it is better to avoid any appreciable quantity of concentrated food shortly before calving, succulence such as ensilage will be found beneficial, especially if the veld is dry, and a little extra condition at calving will usually be repaid to the farmer by an increased production of butter fat during the early stages of the milking period.

The general circumstances of each individual farm vary so much that it is impossible to give an opinion that will hold good in all cases, as to the relative merits of winter and summer dairying. It may, however, be noted that the manure produced by feeding cows in winter is a valuable asset. The opportunity to feed many crops otherwise unsaleable is provided by winter dairying. The farmer is usually less busy in winter than in summer, and has more labour available. The price of dairy products is higher in winter, and a cow calved in the autumn will freshen with the spring and give a greater total yield of milk during any one milking period than if she had calved in the spring. On many farms dairying as a regular part of the farm economy all the year round would appear to be almost essential to success. A moment's consideration of the foregoing will make it apparent that winter dairying is especially adapted to the needs of the farmer in the maize belt. The grass in much of the maize belt proper is admittedly somewhat inferior to that of the ranching districts, but there is no reason why the maize belt dairyman should not keep any good breed of dairy cattle, such as Shorthorns, cross-bred Frieslands, South Devons, Red Lincolns and so forth, provided that he is prepared to feed liberally and well on such feeds as he can produce on his agricultural land.

Coming to the question of feeding, let us consider firstly the case of a farmer in the maize belt. In summer his cows will require little supplementary feeding unless it may be two or three pounds per diem of crushed maize or a little teff hay during December and January when the grass is very rank. After about the middle of May the grass becomes very hard and unpalatable, and with the exception of maize stalks there will be very little useful food for the milch cow on the veld. It will be well to reckon on providing in the manger practically her total requirement.

Taking the average weight of a good milch cow as 800 lbs., she will require for the maintenance of her body about 15 lbs. of dry matter containing protein .56 lb., carbohydrates 6.86 lbs., and fat .08 lb. This may be obtained from a ration made up of ensilage 15 lbs., leguminous hay (as for instance velvet bean) 3 lbs., and stover or veld hay as required, or up to 10 lbs. It is important to note that the small amount of leguminous hay balances a ration which is otherwise deficient and materially enhances the feeding value of the whole. Such a ration is suitable for dry and in-calf cows. Taking the average butter fat content of the milk as 3.5 per cent., the rule is to add to the above ration for every gallon (10 lbs.) of milk produced protein .49 lb., carbohydrates 2.2 lbs., fat .19 lb. This may be provided approximately by ensilage 7 lbs., leguminous hay 2 lbs. The ration, therefore, for a cow giving 2 gallons of milk daily would be ensilage 30 lbs., leguminous hay 7 lbs., stover or veld hay as required.

We will take next the case of the farmer on a granite veld or mixed farm, who finds it necessary to feed his crops to cattle in order to market them economically and to whom dairying is a main source of livelihood. His crops are maize, pumpkins, majordas, ground nuts, beans, peas, green forage (in damp vleis or under irrigation), Napier fodder, teff, sweet potatoes and so forth. As with the farmer in the maize belt he will find a small ration of maize, teff hay or even good veld hay beneficial while the grass is rank and green. If his cows are properly grazed they will require very little artificial food from February to April inclusive, but from May onwards till the spring grass reappears, they will require considerable attention. The standard maintenance ration as described above may be provided somewhat as follows, and will be suitable for down calving cows should they shew any signs of losing condition on veld alone:—

1. Ensilage 14 lbs., ground nut vine 3 lbs., stover or hay 10 lbs. or as required.
2. Green barley 5 lbs., maize 3 lbs., stover or hay 10 lbs. or as required.
3. Sweet potatoes or pumpkins 10 lbs., ground nuts 1 lb., stover or hay 10 lbs. or as required.

Now, to each of these rations we have seen that it is necessary to add as soon as the cow calves protein .49 lb., carbohydrates 2.2 lbs., and fat .19 lb. for every gallon of milk produced; therefore, taking the two gallon cow as a basis and dealing first with No. 1 ration, we must add approximately the following: ensilage 14 lbs., ground nuts 2 lbs., ground nut vine 3 lbs. In the case of No. 2 ration the addition of maize 2 lbs., bean meal 2 lbs., and green barley 5 lbs. is suggested. With No. 3 the addition of 15 lbs. of sweet potatoes or pumpkins, 2 lbs. bean meal and 2 lbs. of ground nuts would be found satisfactory.

In putting forward the above suggestions in regard to rations no attempt has been made at mathematical exactness, but rather an endeavour has been made to provide protein in the right quantity and to make the ration palatable, of sufficient bulk, and as cheap as possible. Attention is directed to the value to the dairy farmer of ensilage. There is no cheaper way of providing the succulence so necessary to the dairy cow in the dry season than by feeding ensilage, and experience throughout the world, wherever climatic conditions are similar to our own, has proved it to be a most satisfactory dairy feed. In using it all that has to be remembered is to make up the protein and the total solids of the ration by the use of such protein rich feeds as beans, linseed, ground nuts, sunflower, velvet bean hay, etc., and good cheap bulky foods such as veld hay and stover. Although no opportunity has occurred of proving its value, the writer ventures to suggest that a lick containing lime would be found beneficial to milk cows on granite soils. A simple way of supplying it would be to mix lime with the ordinary salt in the proportion of 15 lbs. of lime to every 100 lbs. of salt and to keep it in a covered trough available to the cows in a yard or kraal adjoining the milking shed.

Tobacco Culture.

GRADING ON THE FARM.

By H. W. TAYLOR, B.Agr., Tobacco and Cotton Expert.

Upon the advice of the manager and the writer, the Board of the Rhodesian Tobacco Co-operative Society has decided to encourage the grading and handling of tobacco on the farm. This decision of the Board will have a decided effect in placing tobacco cultivation on an economic basis, and the benefit to the industry will be purely of a constructive nature. It is recognised by the Board that the development of the tobacco growing industry is dependent upon this change in the method of handling the cured product, and every grower is, therefore, requested to give the matter serious and thorough consideration.

At the present time all the leaf produced by members of the Society is graded and prepared for market in the central warehouse at Salisbury. The tobacco is baled direct from the curing barn on the farm, generally without regard to size, colour or quality of leaf. In almost every bale leaf of all grades is mixed together. Badly perished leaf is pressed against bright leaf, and depreciation of the better grades results. Badly cured green leaf and leaf of the best quality are baled together in the same condition, so that if the former appreciates in value the latter usually depreciates. This system of indiscriminate baling is annually the cause of considerable loss to the growers. Badly perished leaf is often sent to the warehouse; it has practically no commercial value, but adds to the working expenses for good leaf and increases the percentage of scrap tobacco in handling. Farm grading would largely reduce the amount of perished leaf offered for sale, as the growers would learn that such leaf does not pay for handling.

Under the present system of handling, tobacco is often baled on the farm in too high condition and later becomes mouldy. If the leaf is mouldy when received at the warehouse the blame is clearly on the grower, but if the damage results after the leaf is received at the warehouse it may be almost impossible to determine who is responsible for the resulting damage. It is thought that this loss will in time be largely reduced by farm grading, as the grower alone will be responsible for the condition of his leaf, and he will exercise greater care in this respect.

Badly farm baled tobacco is also the cause of considerable loss to growers. Tobacco is often received at the warehouse which has been so baled that the amount of scrap is very large. This is usually due to the bales not receiving sufficient pressure or having been removed from the press before the bale is properly set. Such bales are considerably damaged in transit, and the grower is thereby the loser. If the bales were finally prepared for market on the farm, the growers would realise this loss and rectify their mistakes.

The above-mentioned defects in the present method of handling tobacco suggested a change, and the matter has now, owing to increased production, become imperative through lack of space at the warehouse. From the past season's crop the Society will handle less than one million pounds, and the work will be continued well into March. If seasonal conditions prevail, the crop this season will be more than double that of last year. In the present warehouse it will be impossible to handle properly the increased production before the end of the financial year or before leaf from the following season reaches the Society. In these circumstances, the warehousing facilities must be increased or grading must be done on the farm. It is thought that the latter is not only more economical, but will be productive of greater good to the tobacco industry.

Under the present system of handling tobacco the grower does not know the final value of a tobacco crop until the succeeding crop is almost ready for harvesting or possibly has been harvested. Any advances he may have received through the bank and warehouse charges are deducted before he receives final payment, and these charges and interest must be added to the cost of production. Therefore, at the present time growers do not know their actual financial standing in regard to one crop of tobacco until another crop is almost matured, which is a very unsatisfactory position. The directors of the Society hope to remedy this unsound practice by advancing each grower 75 per cent. of the value of his crop when it is received at the warehouse and classified. Proper classification can only be carried out when the tobacco has been graded and prepared for market. If grading is done on the farm the grower will know the approximate value of his crop when it is delivered, and will receive 75 per cent. of that value as soon as his work is completed. The remaining 25 per cent. will be paid at the end of the financial year. It will readily be understood that ungraded tobacco cannot be classified when received at the warehouse, and therefore no suitable advance can be made by the Society on tobacco received in this condition.

Grading on the farm will also have an educational value. Growers at the present time do not understand the value of the different grades of tobacco, and also do not see their mistakes in growing and curing their crop. They are, therefore, not able to improve the quality of their product as they otherwise might do. With the present system of handling after curing, a considerable quantity of leaf is annually received at the warehouse which is of such poor quality that the price realised is scarcely sufficient to cover the cost of handling. The sale of such tobacco militates against the disposal of better class leaf, as the former is substituted for or blended with the latter. Farm grading would tend to remove this class of tobacco from the market, as the grower would realise that such tobacco does not pay for the time and money expended in handling after it is grown. If the present system is to be maintained, additional facilities in the form of buildings, staff, labour and equipment must be provided to enable the central organisation to deal with the increased production. The growers themselves must provide the additional facilities, and it is thought that on the farms the equipment and labour would be more economical as well as an individual asset.

Methods of Handling and Grading on the Farm.—Many tobacco growers are imbued with the idea that farm grading is not feasible and requires highly skilled labour. In practice it will be found that most growers can easily and quickly master the work by close attention to details, and that it can easily be carried out on the farm by careful supervision over native labour.

Tobacco should only be roughly graded as it comes from the curing barn. To grade tobacco properly during the curing season would require a large increase in both white and native labour, and sufficient care could not be exercised during this particularly busy period. After tobacco is cured it should be brought into condition and roughly graded into "brights," "mediums," "darks" and "greens." Each grade should be placed in a separate bulk where the leaf is allowed to mature before grading. Bulks are best made about six feet wide and six feet high, but the length can be altered to meet the individual conditions of each grower. It is not necessary to complete a bulk in one day, as tobacco can be added from time to time. Care must be exercised in conditioning the leaf to obtain the best results. If the tobacco is too dry there will be considerable loss through breakage, and the necessary changes will not take place in the bulked leaf. On the other hand, should the leaf contain too much moisture, there is danger of the tobacco becoming damaged through fermentation or mildew. For bulking, or baling, the web of the leaf and the lower half of the midrib should be supple, but the upper half of the midrib should be only slightly pliable. When bulked in this condition the colour of the leaf will be improved, and the proper aroma will develop. In bulking the butts of the leaves are placed outwards and the tips towards the centre of the bulk. The bulks should be examined from time to time, and should the leaf shew signs of fermentation or mildew the bulk should be pulled down, the tobacco exposed to the air and then re-bulked.

When curing is finished grading can be taken in hand. The first tobacco bulked would naturally be the first graded, and this will usually be the bright leaf. In grading no attempt should be made to grade according to the standards laid down by the warehouse. This would be almost impossible, and would result in confusion. All that is necessary or required is that the leaf be graded and baled according to size, colour, texture and quality, and each bale will be placed in its proper grade when the tobacco is classified. No number of grades can be laid down, as each crop will be graded on its merits, and some of the farm grades will be classified into intermediate grades which contain green and perished leaf. In the average crop there will be three grades of clear bright leaf, three grades of medium bright leaf and three grades of dark leaf. These are called straight or standard grades. There will also be leaf of each of these grades which is too green or too perished to be included in the proper grades, and these are classified as intermediates. In many crops of tobacco there is a quantity of very short leaf which should be placed in separate grades. Any leaf below seven or eight inches in length should not be placed in the standard or intermediate grades. Such tobacco should be graded only into bright, medium bright and dark leaf, should not be tied into "hands" and should be baled as loose leaf.

All tobacco, excepting the very short leaf, should be neatly tied into "hands," or bundles, of convenient size, and either baled at once or re-bulked until there is sufficient of each grade for baling. Each bale should contain only one grade of leaf. For baling, tobacco should be in the same condition as for bulking. In baling care should be taken in packing, so that the finished bale will be neat in appearance and compact for handling. As far as possible all bales should be of the same size to save space in transportation and for uniformity in appearance. Very convenient press boxes are in use at the warehouse in Salisbury, the dimensions of which are as follows: 3 feet deep, 34 inches long and 24 inches wide. The finished bales from these presses are about 18 inches in thickness and weigh from 150 to 200 pounds, according to the quality of the tobacco. The bales should remain under pressure at least one hour before being removed from the press, in order that they may retain their shape and compactness. When removed from the press each bale should be covered with hessian of good quality and stencilled with the grower's number, but the grade should not be stencilled on the bale until the tobacco is classified. The bales should then be stored in a cool dry place until grading is finished, when the tobacco is sent to the warehouse for classification and sale. During the time the bales are stored they should be turned weekly and inspected.

If tobacco is properly handled after it is cured it should increase in value, but this is not the case under the present method. Often leaf which is harvested ripe will cure out with a greenish yellow colour. If baled directly from the barn this green colour seldom disappears. If, however, tobacco of this description is placed in bulks, in proper condition, the green colour will disappear, leaving the leaf a clear yellow, which greatly increases its value. Like changes take place in medium, bright and dark tobaccos, with the same desirable results. Bulking tobacco also develops the flavour and aroma which are so desirable in flue cured tobacco, but which are often lacking in the Rhodesian product. Farm grading will also greatly assist in improving the methods of growing and curing tobacco, as each grower will be confronted with his mistakes in these operations when the leaf is being graded. The realisation of the mistakes made will tend to increase the yields and improve the quality of the leaf produced by those growers who produce tobacco on an unprofitable basis. This method of handling tobacco will be of great financial assistance to the planters and business men, as each tobacco grower will know the approximate value of his crop as soon as the leaf is delivered to the warehouse.

Some growers object to farm grading on the ground of additional expense in equipment, but they do not realise that the work can be carried out on the farm cheaper than in the warehouse at Salisbury. The objection has been raised that the small grower is at a disadvantage as compared with the large grower, if the tobacco is graded on the farm. It is argued that the small growers cannot afford the additional equipment. It would appear, however, that this objection is not well founded, as the cost of grading is small compared with the cost of growing and curing tobacco. If small planters can afford to grow tobacco at all, they can also afford to grade on the farm.

At the present time the successful Turkish tobacco growers grade and prepare for market all of their leaf, and do so at a profit. The Tobacco Company of Rhodesia and South Africa grades and prepares for market all of the tobacco grown on its estates, and the work is properly carried out. In the Union of South Africa and in Nyasaland all of the tobacco is graded on the farm and under the same conditions as prevail in Southern Rhodesia. Practically all tobacco produced in America is farm graded. If tobacco is graded on the farm in other tobacco producing countries, there is no valid reason why this work cannot be done on the farms in this Territory.

Salisbury White Maize

By H. G. MUNDY, F.L.S., Agriculturist and Botanist.

For some time now the relative merits of Hickory King and Salisbury White have proved a fruitful source of discussion, and from opinions freely expressed it seems evident that not a few farmers have either forgotten, or having more recently taken up farming in Rhodesia, have never given thought to the causes which originally led to the introduction and popularisation of the type of maize now known as Salisbury White. In view of the differences of opinion regarding the desirability of retaining this maize as an accepted breed in Rhodesia, it may be of interest to trace briefly its origin and history as known to the writer.

In the early days of maize growing in this Territory many of what were considered the most promising American breeds of maize were introduced from that country, and among these were Hickory King, Virginia Horse Tooth, Boone County and Golden Eagle, while from Natal came Natal White Horse Tooth. Hickory King quickly proved its suitability to Rhodesian conditions, but on many farms the two horse-tooth strains were found somewhat slow in maturing, with the result that yields suffered accordingly. Boone County and Golden Eagle both gave excellent results on the richer soils and in good seasons. As was only to be expected, however, the growing of these several breeds often on the same farm quickly led to a good deal of promiscuous crossing, and from these crosses emerged the hybrid later to be named Salisbury White. In those days it was generally thought that the hybrid was the resultant cross from Hickory King and Horse Tooth. However this may be, in its early form it partook generally of the characteristics of both these breeds, producing 10 to 16 rowed ears with large kernels, deeper than those of Hickory King, much broader than those of Horse Tooth and usually with but slight roughening at the base. It required a shorter growing period than the horse tooth type, and was commonly accepted to give, on the richer soils, a heavier acre yield than Hickory King. Gradually its reputation spread, more particularly in the Mazoe Valley, and by 1909 the types of maize generally grown on what is now termed the maize belt had resolved themselves into Hickory King, Boone County, Salisbury White and Golden Eagle. Farmers were, however, realising the impossibility of keeping their white breeds unmixed so long as Golden Eagle was grown. Boone County also was losing popularity, since it was found that unless grown under favourable conditions of soil and season it often "ran out," gave poor yields and produced a thin, starved and excessively chaffy grain.

The elimination of breeds had reached this stage and production was rapidly increasing when maize blight or white rust became alarmingly apparent, chiefly in the Mazoe Valley, but also on the farms around Salisbury. The attention of the Department of Agriculture was called to this trouble early in 1909, and it was one of the first problems the writer was required to investigate after his arrival. In 1909-10 the infestation was very severe, the yield of many crops being reduced by 15 to 25 per cent., while it continued to cause serious loss for two more seasons.

A tour of the maize growing areas made it apparent that Hickory King and Salisbury White were equally if not more resistant to the disease than Boone County or Golden Eagle. Variety trials to test relative susceptibility were at once commenced and continued for three seasons, both in the Mazoe Valley and on the Gwebi Flats. These experiments indicated that of Hickory King, Salisbury White, Boone County, Golden Eagle, Iowa Silver Mine, Champion White Pearl, Chester County Mammoth, Leaming, Yellow Hogan, Eureka, Virginia Horse Tooth and Natal White Horse Tooth, the first two named suffered least injury from the disease. The susceptibility of Boone County, and in the case of Golden Eagle the London Corn Exchange's report on white *versus* yellow maize (*Rhod. Agric. Journal*, Feb., 1911), with their other relative disadvantages already referred to, practically gave these two varieties their *coup de grace.* Hickory King and the hybrid Salisbury White were thus left in possession of the field. The former was more widely grown, but the fact that the latter possessed the power of cropping more heavily than Hickory King on the richer soils was never at that time, so far as is known, questioned.

The policy of the Department of Agriculture in encouraging the growing of Salisbury White in addition to Hickory King was based on the following considerations:—

(a) It had, with Hickory King, been found resistant to blight and capable of giving good yields year in and year out.

(b) General experience indicated that on the richer soils Salisbury White gave heavier crops than Hickory King.

(c) In type and appearance Salisbury White closely resembled Hickory King, and it was realised that this fact would be of material advantage when the time came to export our grain overseas. It was realised that maize production in the Union of South Africa was handicapped by the large number of different types being grown, and it was believed we should be better able to make a name for Rhodesian maize on the overseas market if, as far as possible, on the maize belt, one type only—large flat white—was produced.

It may now be claimed in 1920 that this end has been achieved, for to-day our reputation as producers of this type of maize stands preeminent.

In order to maintain the broad kernel as similar as possible to that of Hickory King, growers were advised to aim at a twelve row ear, and up to the end of 1914 progress towards that end seemed satisfactory. It would appear probable, however, that many of the Salisbury White strains had at some time been crossed either intentionally or accidentally with Boone County before this breed was discarded. As is known, Boone County even of pedigree strains shews considerable variation, the number of rows ranging from 18 to 22, while here in Rhodesia the kernels, especially in unfavourable seasons, frequently tend towards extreme roughness at the base and chaffiness. Local experience shews that these two characteristics are very pre-potent, most crosses with Boone County shewing the same features to an increasing extent year after year unless checked by selection. It is not improbable that this "taint" of Boone County in our Salisbury White has given rise to the extreme chaffiness sometimes complained of, and may also have rendered more difficult the fixing of a twelve row type.

In the *Rhodesia Agricultural Journal* of August, 1910, the writer warned growers against allowing their Salisbury White to develop undue roughness and chaffiness. This advice was repeated in lectures and at agricultural shows when discussing the maize exhibits, but it was also pointed out that a *slight* roughening at the base was always accompanied by increased depth of grain, and was therefore desirable if not carried to excess. It would seem, however, that with some growers this warning has been overlooked, with the result that for this reason in part Salisbury White may have suffered in popularity.

A second drawback advanced against Salisbury White is the difficulty experienced in securing a fixed type which will breed true and possess reasonable uniformity as regards number of rows. This, however, should not prove insurmountable—some growers already obtain upwards of 70 per cent. of twelve row ears—and, as is well known, a large number of other recognised breeds suffer from the same defect, if to a lesser degree. Further, it may be found easier to fix a fourteen row type than a twelve row without seriously decreasing the size of the grain.

A third argument used against the breed is that, being an unfixed type, it is unsuitable for an export seed maize trade. Before this point need carry great weight, however, we must know to what extent a seed maize trade can be built up. Opinions differ, but in a recent letter received from the London Corn Trade Association it is stated that the question of the export of seed maize from South Africa to Europe has always been largely misunderstood, as the demand for actual seed maize is quite small, and, including the Continent, would not exceed a few hundred tons in any season. The bulk of our export overseas seems likely to remain, therefore, in commercial grain for manufacturing purposes, and there is no evidence yet that the European market will discriminate between Hickory King and Salisbury White.

From the breeders' point of view the success of Salisbury White on the last Johannesburg Maize and Fat Stock Show, when in competition with the "other" white breeds of the Union, speaks for itself. Had it not been a desirable type it would not have achieved this success. The fact that less is at the present time heard of its superior cropping powers to Hickory King may perhaps be attributed to two causes:—

(1) That the last two seasons being abnormally wet have not suited our lower lying and richer soils on which Salisbury White is usually grown.

(2) That much of the maize belt land is becoming impoverished by constant cropping, and that during the war fertility has been reduced owing to the difficulty of procuring artificial fertilisers.

These causes are transitory, and under more favourable conditions Salisbury White may make good its claim to superior cropping powers. Of one fact we may be quite sure: no one breed and strain will prove universally satisfactory throughout the varying conditions of soil and climate of Southern Rhodesia.

If a fixed type can be found equally suited to all our local conditions, of equal quality to our best strains of Salisbury White and capable of giving as good yields as the latter, then by all means let us adopt it and discard Salisbury White, but until this type is found and proved it would, in the writer's opinion, be poor policy to cold shoulder a breed which has in so many respects proved well suited to the country.

Tobacco Pests of Rhodesia.

By Rupert W. Jack, F.E.S., Agricultural Entomologist.

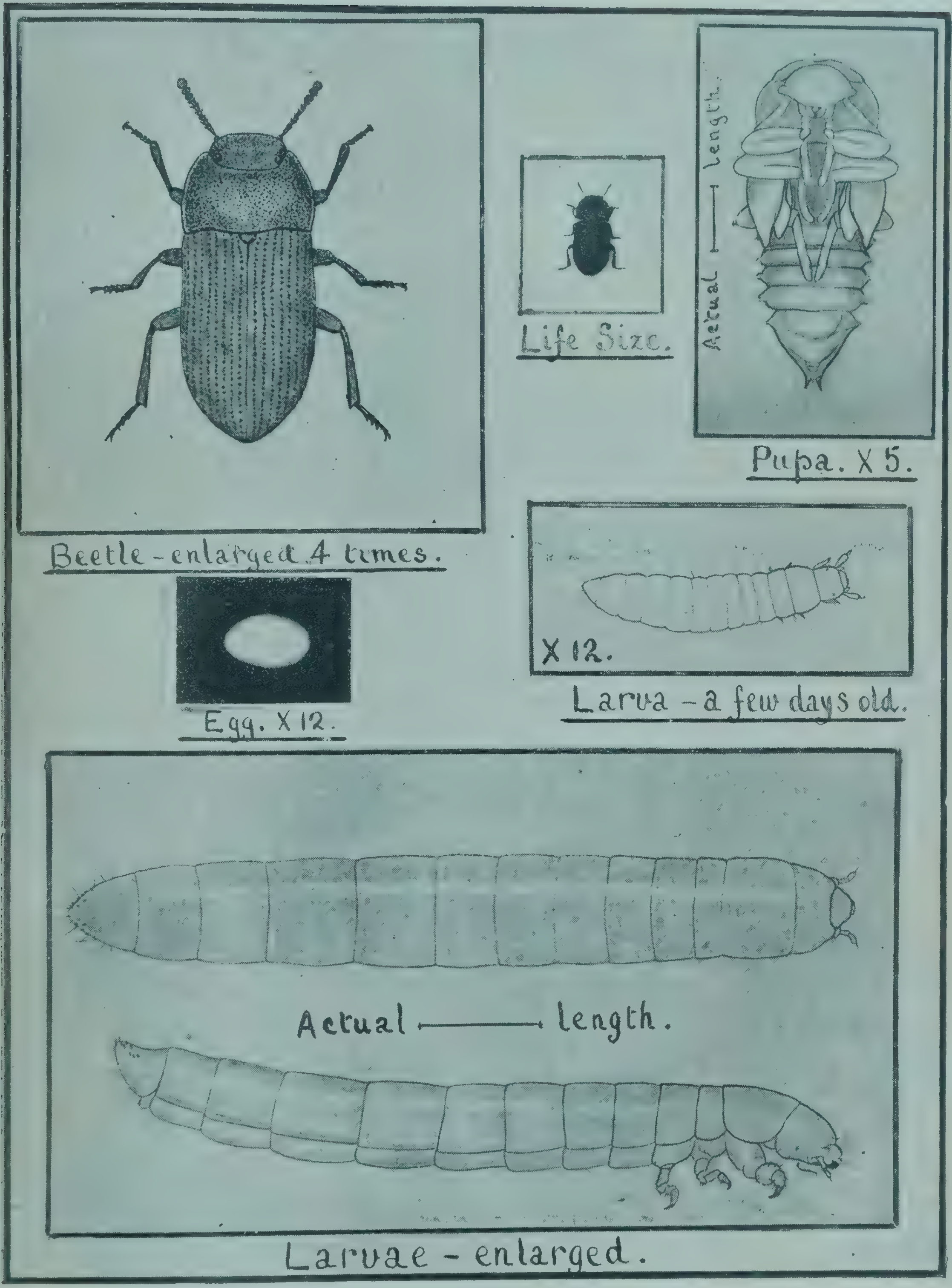
PART II.

Surface Beetles.—Certain species of Surface Beetles (*Tenebrionidæ*) do damage to newly planted out tobacco, eating into the stem at the ground level after the manner of cutworms. A species of *Gonocephalum* (see Plate VI.) and two species of *Zophosis* (see Plate VII.) have been associated with this form of injury. Once the plant gets a real start, however, the injury from *Zophosis* ceases entirely and that from *Gonocephalum* is usually nearly negligible, although this depends upon the season, the beetle being much more destructive in dry weather than in wet.

The life history of the two species is similar. The bulk of the adults emerge a short time after the first heavy rains, usually in late November or early December. Eggs are not, however, laid until March, and egg-laying continues throughout the dry season, though most are laid in April and May. The eggs hatch in 7 to 10 days, and the larvæ feed on dry vegetable matter in the soil. When full grown they pupate in a small earthen cell in the soil. In most cases this takes place from the beginning to the middle of November. Three weeks later the beetles appear.

Control.—*Gonocephalum* is easily destroyed with the poisoned bait recommended against cutworms; in fact, its destruction is a simpler matter. Arsenite of soda may be substituted for the Paris green, as it is much cheaper, and chopped grass for the more succulent green stuff demanded by cutworms. *Zophosis*, on the other hand, has uniformly failed to succumb to this kind of bait, being apparently not attracted by sugar or molasses. A practicable method of destroying these beetles, in fact, remains to be devised.

Wireworms.—The insects which go under this name in Southern Rhodesia are not the true wireworms of the north temperate zone, but are the larvæ of a different family of beetles, namely the *Tenebrionidæ*. Those belonging to two genera, namely *Psammodes* and *Trachynotus*, have been found very injurious to tobacco in this Territory. *Psammodes* (see Plate IX.) is the genus to which the well-known "Toktokje" beetles belong. *Trachynotus* beetles (see Plate VIII.) have no common name. Where injury occurs the larvæ or grubs are present in the land at the time of planting, and eat into the underground stems of the plants, causing wilting and death. Sometimes two or three successive plantings



Beetle - enlarged 4 times.

Life Size.

Pupa. X 5.

Egg. X 12.

Larva - a few days old.

Larvae - enlarged.

Actual length.
X 12.
Actual length.

Plate VI.

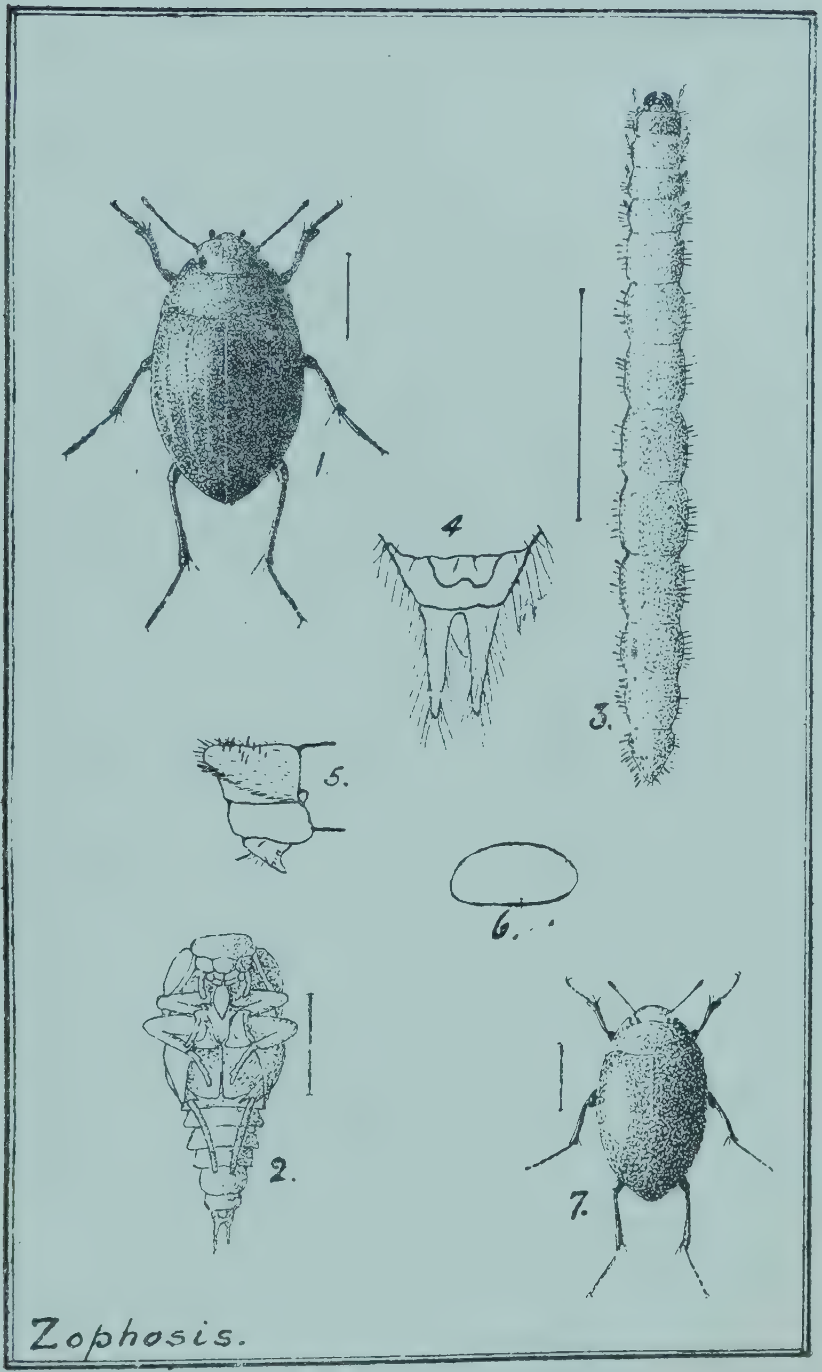


Plate VII.

are destroyed; in fact, it is frequently impossible to obtain a stand of plants on infested ground.

The life cycle of *Psammodes scrobicollis* (Fahr.), the commonest injurious species, is rather prolonged. The beetles emerge after the first heavy rains of the season, and commence egg-laying almost at once. These hatch in rather over a fortnight. The young grubs probably feed upon humus in the soil at first. They soon develop into smooth, whitish or yellowish grubs of elongate form, with a hard shiny integument. They feed upon the underground portions of living plants, at least in part, and grow fairly rapidly during the summer. As the dry season advances, however, they either go deeper into the soil or shelter under stones and seem to take little nourishment, although they do not apparently lie up in a cell, as many other beetle larvæ do in the winter. They resume their activity with the advent of summer moisture, and again make considerable growth before the next winter, when they shelter again. A third summer's activity brings them to full growth, and between this and the following spring they pupate, the beetles emerging from the ground after the first heavy rains. A full-grown larva of *Psammodes scrobicollis* measures 2¾ inches in length. The development occupies nearly three years. During the first season the larvæ are too small to do much damage, but they are injurious during the second and third seasons.

A second common species of *Psammodes* is *P. similis* (Pering). This is considerably smaller than *scrobicollis.* Its life history has not been fully followed, but there is reason to believe its development may occupy only two years. The habits are similar to those of the other species.

Species of *Trachynotus* have actually been associated with even greater injury than *Psammodes.* Two species at least are involved, but their identity is uncertain. They are very similar in appearance. These beetles do not appear until April and May, and lay eggs at once in the soil. The larva grows rapidly during the winter, and by planting time next spring may measure nearly an inch in length. Attack on tobacco is of a similar nature to that of *Psammodes.* The life cycle is usually completed in one year, but a small proportion of individuals in confinement have remained as practically full-grown larvæ over a second year.

Attack on tobacco in the case of *Trachynotus* usually occurs on newly broken soil, but this is not invariably the case, as instances have come to light where serious loss has occurred on soil cultivated continuously during as many as five years. Severe injury from *Psammodes* has occurred on soils both the first and second year after breaking, as is to be expected from the life history of the pest. Attack involving considerable loss has also been recorded on lands cultivated longer than this, but there are at present no records of overwhelming attack later than the second year, though the possibility of such occurring is not to be ignored. It may be noted that, whereas *Psammodes* injury is confined to sand veld, *Trachynotus* is also injurious on red soil.

Control.—No method of freeing the soil of the pests or of protecting plants in infested soil is known. Poisoned bait mixed with meal or bran inserted into the soil has failed to attract the grubs even within the limits of a flower pot. *Trachynotus* beetles are, however, attracted by sugar or molasses, and are readily killed by the same formula of poisoned bait employed against surface beetles, to which they are, of course, allied. To utilise this fact necessitates a certain degree of foresight on the part of the tobacco planter. The beetles, as already stated, are active in April and May, and in order to destroy them before egg-laying has proceeded very far, measures must be taken about the end of April, and repeated later in order to deal with belated emergencies. Land which it is intended to plant should be ploughed and levelled off before April the previous season, and inspected carefully late in April. If the beetles are very numerous, the planter has the choice between attempting to destroy the beetles before they have laid the bulk of their eggs or of choosing a different piece of ground. Anyone who has experienced the loss due to fruitless attempts to obtain a stand of tobacco on badly infested soils will realise the importance of making a preliminary survey at the right time in regard to these pests.

Psammodes beetles, the well-known "Toktokjes," are very conspicuous in the early morning and evening after the first wetting rains of the season, and should be destroyed ruthlessly. They are very fond of wandering about roads and footpaths, and a little attention early each season may well be repaid by freedom from loss later.

Grasshoppers.—These are frequently very troublesome in respect to newly planted tobacco. The burning of a broad strip of grass around the tobacco lands shortly before planting out, as mentioned in connection with cutworms, is likely to have a beneficial effect, where feasible. Transplants may be dipped head downwards as far as the roots in arsenate of lead (paste) 1 lb. to 12 gallons water as a protective measure. Heavy sprayings with arsenate of lead may be used to check attack on growing plants where the damage is sufficient to justify this measure. Regular cultivation is stated to discourage attack.

Crickets (Plate IV., Fig. 5).—A large species of cricket which is common in sandy soils frequently damages tobacco. This insect lives in a burrow in the soil, whence it emerges at night to forage for food. It severs the leaves of tobacco plants and drags them into its hole. For this purpose the leaf is rolled up in a remarkably neat manner, and specimens are frequently found lurking inside the rolled leaf within the burrow. Whether this is the insects' usual practice when the leaf is only required for immediate consumption, or whether it has anything to do with the breeding habits, has not been ascertained.

The following poisoned bait is reported to be effective against this pest in the Transvaal:—3 lbs. bran, green grass or lucerne, ½ lb. sugar or treacle and one dessert spoonful arsenite of soda or Paris green. As a rule, however, they are dug out by hand. The natives are fond of these crickets for eating purposes, and take kindly to the work of capturing them.

Root Gallworm (*Heterodera radicicola*). Plate X.—This insidious and dangerous pest has been more in evidence in tobacco lands during the past two seasons than in previous years. This is possibly due in part to the exceptionally heavy rainfall, but there is evidence that the pest is spreading, a state of affairs which can only be viewed with apprehension.

The Root Gallworm is not an insect, but a very small worm, which makes its way into the roots and underground stems of plants, causing the growth of irregular swellings or galls. These interfere greatly with the supply of nourishment to the aerial portions of the plants. Infested plants, therefore, tend always to be unthrifty, whilst heavily infested plants may fail altogether. Soil infested with the gallworm continues to harbour the pest indefinitely, provided the conditions are favourable, and becomes useless for growing any plants subject to attack. Certain varieties of otherwise susceptible species of plants, including tobacco, are, however, more or less resistant to the gallworm's attack, and may be grown profitably on infested soil. The soils most liable to heavy infestation appear to be sandy loams under irrigation, but naturally moist sandy vleis are also very susceptible. The worm does not seem to increase unduly in land which dries out to a considerable depth, and this fact must account for the general freedom of tobacco lands in this Territory. The heavy rainfall of the past two seasons would modify conditions somewhat in this respect, and may have encouraged the pest on that account. The gallworm is probably not a native of this Territory. It is a well-known pest in Europe, and has doubtless been introduced to South Africa through the medium of infested seed potatoes. It is now widely distributed throughout South Africa, and potatoes imported from the South Africa Union are quite frequently infested. Whenever this infestation is detected by the Plant Inspectors, however, the consignment is refused admittance to the Territory. Such potatoes undoubtedly constitute the main channel through which the pest is spread over great distances, and it is obvious that low-lying land, on account of its suitability in respect to vegetable growing, is very liable, if the owner is ignorant of the danger, to become infested. Such land is also well adapted for tobacco seedbeds, and this fact constitutes a distinct danger.

Control.—Avoid introducing the pest through the medium of seed potatoes, transplants or other agencies. Sterilise the seedbeds thoroughly by heavy firing. If land has become heavily infested, abandon it as far as tobacco is concerned, or grow a resistant variety. Maize and small cereals are not attacked, but practically all other crops are. No method is known of ridding the soil of the pest, and although certain measures are adopted to reduce infestation where land is very valuable, they are not at present applicable to tobacco lands in this Territory.

General Summary.—Having dealt separately with the various pests which are liable to attack tobacco crops in this Territory, it will undoubtedly be advantageous from the growers' point of view to consider these pests as a whole, and to give *general* directions of avoiding loss as far as this can be done. For this purpose the growing of the crop may be followed from the selection of the site for the seedbeds to the harvesting of both the leaf and the seed.

Seedbeds are usually situated in a depression on account of the exigencies of the water supply. Such a situation renders them particularly liable to cutworm and other insect attack, and is frequently favourable to gallworm infestation. It is, however, commonly quite unavoidable, and the writer's object is merely to indicate the general principle that seedbeds on high ground are less liable to troubles of this description, and that where there is a choice the higher site is preferable. The seedbeds should not be made in old gardens, as these are liable to be infested with gallworm. The seedbeds should be sterilised as thoroughly as possible by fire, as this, in addition to destroying weed seed, acts as a protection against gallworm and certain diseases. The surroundings of the beds should be kept free from vegetation. The seedbeds should be built as neatly as possible with brick sides, and the covers carefully sewn together to form one piece and kept free from holes. The covers should be weighted down carefully, so as to be as insect-proof as possible, and should always be replaced before sundown. The insect-proofing of the beds is of great importance in avoiding the attack of cutworms, other caterpillars, stem borer, splitworm, grasshoppers, etc. The plants in the beds may be sprayed with arsenate of lead (paste) 1 lb. to 16 gallons water or (powder) 1 lb. to 30 gallons water once a week from the time the plants shew foliage of about the size of a sixpence. This is a protection against cutworms and the insects just mentioned. The regular spraying should be continued until the plants are removed to the field.

Ground which it is intended to bring under tobacco should be broken the previous wet season, harrowed thoroughly so as to level it off, and kept free from vegetation. If the ground is infested with lesser wireworms (*Trachynotus* sp.), the beetles will be very much in evidence towards the end of April, and the grower will do well to make an inspection of the land at this time. Lack of cover tends to discourage the beetles and drive them into the surrounding veld, where the bulk of the eggs will be laid. If the beetles are very numerous, they may be killed by distributing poisoned bait. Owing to the prolonged life cycle it is not possible at present to recommend any means of protection against the larger wireworms (*Psammodes* sp.), but the beetles should be killed whenever seen.

A wide strip of grass should carefully be kept unburnt around the tobacco lands until close to planting time, when it should be fired. In this way considerable quantities of grasshoppers are likely to be destroyed, as also are many other insects that may be present. Grasshoppers are particularly liable to invade the land from the surrounding veld. *Keep the land absolutely free from weed growth and other vegetation up to the time of planting*, as a guarantee against cutworm attack. Also, keep it as clean as possible after planting, as weeds always tend to encourage insects.

If the presence of cutworms or surface beetles (*Gonocephalum*) is suspected, the land should be treated with poisoned bait as directed for these pests.

Transplants may be dipped head downwards as far as the roots in arsenate of lead (paste) 1 lb. to 16 gallons water, or arsenate of lead (powder) 1 lb. to 30 gallons, as a protection against chewing insects.

A sharp look-out should be kept for caterpillars, including budworms. Caterpillars may be destroyed by spraying or dusting with

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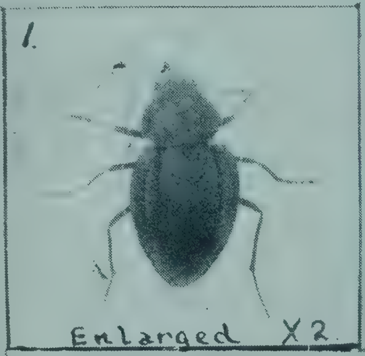

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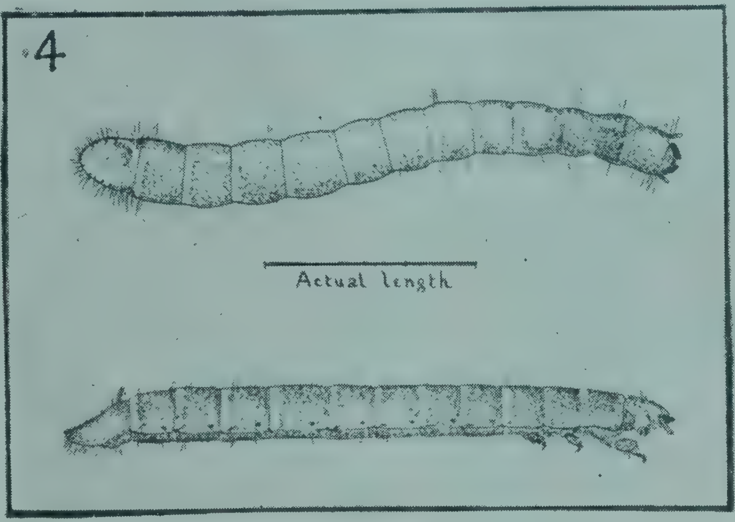

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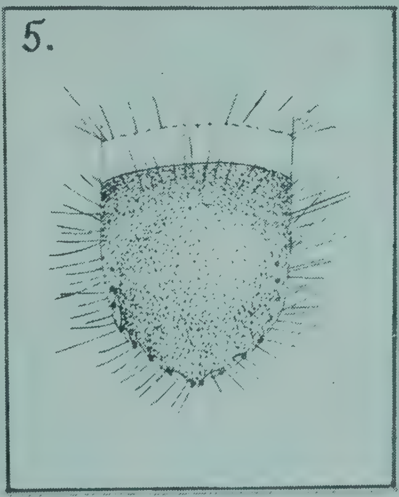

Plate VIII.

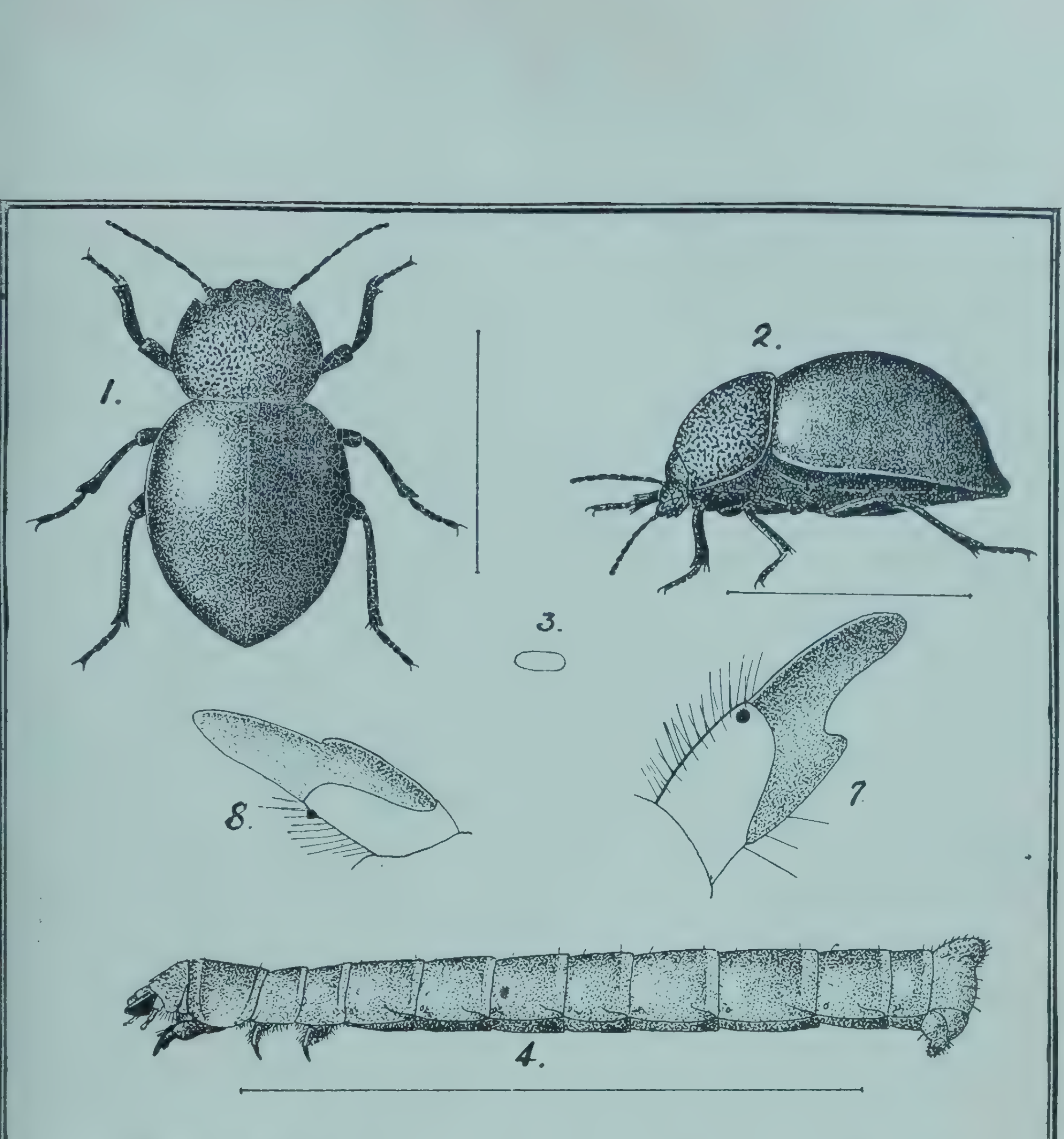

Plate IX.

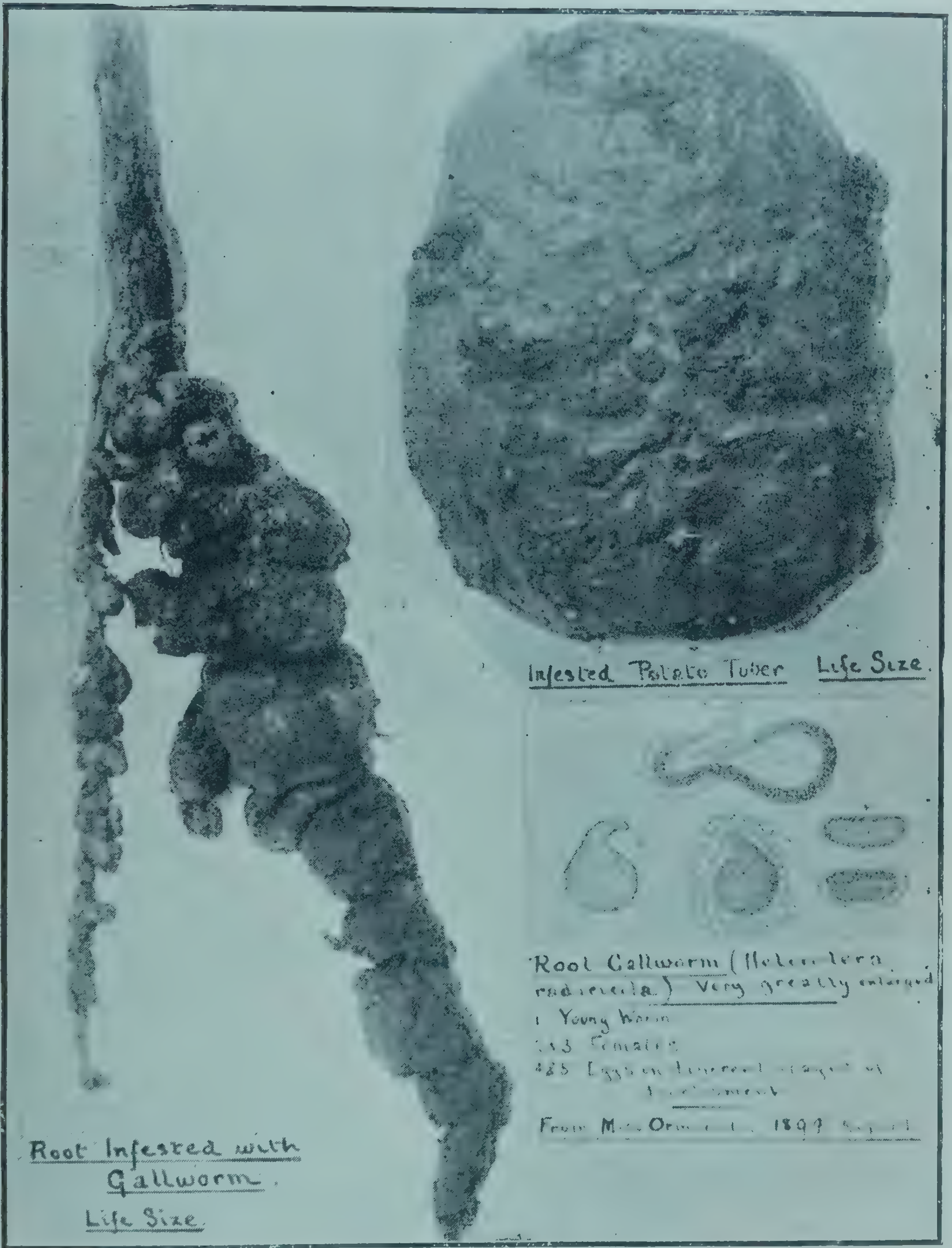
Infested Potato Tuber Life Size.
Root Gallworm (Heterodera radicicola) Very greatly enlarged
1 Young Worm
2 & 3 Females
4 & 5 Eggs in different stages of development
From Miss Ormerod's 1899 Report
Root Infested with Gallworm.
Life Size

Plate X.

arsenate of lead or Paris green as recommended. For the budworm only the heart of the plant needs treating.

Paper bags should be used for enclosing the seedheads, and the heads should be carefully examined for eggs or young budworm larvæ before enclosing. If found, these should, of course, be destroyed.

In preparing the foregoing account, I have pleasure in acknowledging the advice of Mr. H. W. Taylor, Tobacco and Cotton Expert.

EXPLANATION OF PLATES.

Plate VI.—*Gonocephalum* Surface Beetle. Details on plate.

Plate VII.—Fig. 1. *Zophosis bœi* adult ("Surface Beetle"); magnified three diameters; actual length of insect indicated by hair-line adjacent.
Fig. 2. *Z. bœi* pupa; magnified three diameters.
Fig. 3. *Z. bœi* larva; magnified three diameters.
Fig. 4. Anal segment of pupa, ventral view; greatly enlarged.
Fig. 5. Anal segment of larva, lateral view; greatly enlarged.
Fig. 6. Egg of *Z. bœi*; greatly enlarged.
Fig. 7. *Zophosis* Beetle, species unknown; common on sand veld and injurious to newly planted tobacco; magnified three diameters.

Plate VIII.—Fig. 1. *Trachynotus* Beetle; magnified two diameters.
Fig. 2. *Trachynotus* Beetle; natural size.
Fig. 3. *Trachynotus* pupa; somewhat enlarged; actual length indicated by hair-line adjacent.
Fig. 4. *Trachynotus* larvæ ("Wireworms"); enlarged.
Fig. 5. Anal segment of larva from above; greatly enlarged.

Plate IX.—Figs. 1 and 2. *Psammodes scrobicollis* adults; enlarged 1½ diameters.
Fig. 3. *P. scrobicollis* egg; enlarged 1½ diameters.
Figs. 4 and 5. *P. scrobicollis* larvæ (larger "Wireworms").
Fig. 6. *P. similis* adult; enlarged 1½ diameters.
Fig. 7. Anterior tarsus ("foot") of *P. scrobicollis*; enlarged.
Fig. 8. Anterior tarsus of *P. similis* larva; same magnification as Fig. 7.
Fig. 9. Anal segment of *P. scrobicollis* larva, lateral view; greatly enlarged.

Plate X.—Root Gallworm (*Heterodera radicicola*). Details on plate.

Percentage of Butter Fat in Cream.

By A. Brunn, Manager, Gwelo Creamery.

Milk is a chemical mixture of :—

Fat	3.5	per cent.
Albumen-casein	3.5	,,
Sugar	4.5	,,
Ash	.8	,,
Water	87.7	,,
Total	100	,,

When milk is separated, the centrifugal force forces the heavier parts in the cream from the lighter, that is to say, water, albumen, casein, sugar and ash are parted more or less from the fat. As the first-mentioned substances deteriorate very easily under favourable conditions, it is advisable in a hot climate like Rhodesia to have cream testing rather higher than would be necessary in a cool climate. From 45 to 50 per cent. will, if other things equal (cleanliness, etc.), give the farmer a much better result than with cream testing from 35 to 45 per cent. ; of course a point on either side of 45 to 50 would not make any difference.

Testing Cream.—I feel sure that very few farmers know the reasons for variations in cream tests, and will therefore make a few remarks on this. A sample for testing purposes is taken out of each can of cream on arrival at the creamery. To ensure the sample being a correct one, the cream is thoroughly mixed. This sample is then tested in a Babcock tester for its percentage in butter fat. Cream suppliers sometimes complain that tests are too *low*, and in support they generally state—

(a) a churning at the farm gives higher returns of butter, or
(b) the separator has not been altered since the cream gave a higher test.

With respect to (a) the following points should be remembered :—

(1) Butter fat and butter are not identical. Butter fat is practically pure fat, whilst butter (commercial butter) is a mixture of butter fat, water, salt, a little curd, casein, etc. Farm butter, either worked by hand or by hand machines at a much higher temperature than at the dairy, where cooling facilities are at hand, often contains as much as 20 per cent. of water, whilst well-worked creamery butter frequently contains but 10 per cent. of water.

(2) It is illegal in some countries for butter to contain more than 16 per cent. of water. An Act was recently passed in the Union to this effect.

(3) When the weight of salt, curd, casein, etc., is taken into consideration there may be as much as 20 to 25 per cent. difference between the results of churning on the farm and the butter fat returned from the creamery.

(4) Again, when butter is required on the farm, the cream is usually taken from the top of the cream can, where it is of course much richer than at the bottom, and thus higher and incorrect results are obtained from the churn than if the cream were well mixed and a fair sample were churned. If the top of a can of 35 per cent. butter fat average is separately tested it may shew a result of over 60 per cent., whilst the bottom may shew but 15 per cent. or under.

In regard to (b) the following are some of the causes of a separator giving irregular results in butter fat tests:—

(1) The cream hole may be clogged with scum.

(2) The cream regulating screw may have worked loose unknown to the operator.

(3) The flow of milk may not have been uniform.

(4) The milk may have been too cold during separating. (*Note.*—It should not be less than 90 degs. Fah.)

(5) A change of pasture or feed or water for the cows.

(6) The proper speed for the separator may not be attained or the milk may run in whilst the machine is going too slow.

(7) Bad working of the separator through being out of level, spindle worn, inferior lubricating oil, etc.

(8) The speed of turning the handle may have varied.

(9) A very hot or cold day.

(10) A considerable difference is noticeable between the test of milk from cows that have recently calved and those that have been in milk a long time.

Devon Cattle.

THE EDWALENI HERD.

By "DEVONIAN."

The Edwaleni herd takes its name from the site of the ranch homestead, "Edwaleni" (the place of the big black boulders). The property is known as the Umguzaan block, and is in the Nyamandhlovu district. It is located 20 miles from Nyamandhlovu Station on the Victoria Falls line, and 50 miles from Bulawayo, with each of which places it is connected by good roads.

The Umguzaan block is one of the choice places of Rhodesia, and is 40,000 acres in area. It is a kidney-shaped valley, surrounded by high "Gusu" ridges, having a 12 mile frontage on the Umguza River. The Umguzaan, a large perennial stream, flows diagonally through the property, and with its tributaries provides an abundant supply of water. The soil is mixed basalt and sandstone of great fertility, and produces an abundance and variety of sweet grasses. The district, and the Umguza Valley in particular, is one of the best known stud stock breeding areas in the country. The homestead is on the point of one of the flat-topped basalt ridges, and commands a view for miles up the valley of the Umguzaan, and across the Umguza to the Shiloh Hills.

The Edwaleni herd is perhaps the largest herd of pure-bred cattle in the country, there being over 250 head of Devons registered, or awaiting inspection and registration, besides a number of pure-bred cows and their progeny, of which there is no written evidence of breeding. In addition to the pure-bred cattle there are about 1,000 head of grades of various degrees of breeding. Practically all of the "rough" stock were colonial cows, few native cows having been bred from. An exceptionally promising home-bred colonial bull is used occasionally, otherwise all bulls for grading up are imported from England.

The herd was founded in 1908 by Mr. St. C. B. Gwynn, and acquired from him in 1914 by the present owners, Messrs. Gwynn's Rhodesian Estates, Ltd. The foundation of the herd was the purchase of 22 Devon heifers and the bull "Exchange" from Mr. W. R. Southey, of Cape Province. Mr. Southey dying shortly after, a further 20 selected heifers were bought at the estate sale in 1910, together with the bulls "Gordon II." and "The Don." In the same year three cows were acquired which had been bought for the Rhodesian Government. One of these, "Lady Rose," proved an excellent investment, as she is suckling her tenth calf and carrying her eleventh, though now 15 years old. In

1911 eight more picked heifers were bought, and the bull "Robin." Altogether 116 cows and heifers have been bought, representing the blood of many of the best English herds, amongst them being one lot of ten from the "Highfield" herd in 1916, and three females of the famous "Willett" herd of Mr. G. L. Cornish, the oldest Devon herd in England.

The bull "Exchange" proved a great sire, and many of the best of the older cows in the herd are his progeny. He was very deep, and in summer condition carried a wealth of flesh on short legs.

The bull "Robin" was used for a short time pending the arrival of "Northmoor Monarch." This bull was selected as of the same type as "Exchange." With a grand body on short legs, he possessed in addition a splendid constitution, which he has passed on to his progeny. Mated to the get of "Exchange," he has fixed what might be called the typical "Edwaleni" type, long and low, with well sprung ribs and good doers.

The best of "Monarch's" female progeny are named "Princesses," and to mate with these the bull "Northmoor Moneymaker" was bought. He is a half brother of "Monarch," out of the same cow; not quite so short on the leg, but with even a greater width of loin, depth of flesh, and handling especially well, even for a Devon. It is too early yet to judge the result of this mating, but the youngsters, particularly the heifers, look very attractive.

To carry on the work of improvement an order was sent to England in 1916 for the "best two-year-old bull to be bought in England," and in response the bull "Clampit Gauge" was sent; and though he was champion at Taunton and reserve champion at the Royal, he was beaten at Bulawayo by "N. Moneymaker." Before leaving England he had been used in two of the best known herds. He was an example of the best "modern" Devon, with exceptional quarters and great length and width of loin. Since his arrival he has been the chief stud bull and has stamped his progeny in a most attractive mould, but of a different type from the "Exchange" and "Northmoor" breeding.

There has just arrived at Edwaleni the bull "Noble Lad," bred by His Majesty the King at Windsor. His sire was "Highfield Noble," first and champion at the 1913 Royal, and his dam the famous cow "Beauty 2nd," first and champion at the 1915 Royal.

In addition to the foregoing, a number of other bulls from England have been used occasionally, but are retained for use with the grade females. Four more bulls are being bought from England for the same purpose, though each is to be specially selected for real dual-purpose type and high quality.

Amongst the best females are "Lady Rose," "Miss Stewart," "Highfield Cinderella," "Willett Daffodil," "Broad II.," "Miss Trump VIII.," "Beauty of Bath," "Moss Rose XVIII.," "Lady Robin," "Molton's Beauty," "Highfield Miss Lily," "Milkmaid," "Brown Eyes," "Tiverton Jewel," "Highfield Prettymaid," "Daffodil's Duchess," "Willett Buttercup 13th," "Princess Flora," "P. Pat," "P. Stella," "P. Beatrice 2nd" (first and champion, Bulawayo, 1918), "Edwaleni Farthing," etc.

The system of management is simple. The pure-bred cows run throughout the year in camps, in herds of about 35 head, with the bull selected for the season. A native is in attendance in each camp to oversee them and pump water from a well direct into the troughs fresh as needed. Except for age or illness, none of the cows is fed. A stockade is erected near the water in each camp into which the calves can go, and food is placed there for them. Calves are weaned at about eight months, and the bull calves are herded near the homestead and fed once or twice a day, sufficient to maintain them in good growing condition only. Heifer calves get the same treatment, but not quite so much food as the bulls. The latter are usually sold young to ranchers, a few only being kept back to supply individual orders from farmers who want bulls of a serviceable age.

Heifers are camped and run the year through, and the first winter after weaning get some food once a day. Only a few backward ones are fed their second winter. They are mated at about 30 months old. Accidental matings occasionally occur earlier, one heifer having calved at 17 months.

Very few animals are heavily fed or forced in size and condition for sale and show, the object being to prove the fitness of the breed for natural conditions (so far as is consistent with a stud herd), and to breed a large number of bulls for sale at a reasonable price, rather than a few at high prices. The natural conditions under which the cattle run account for the fact that so few of the Edwaleni-bred animals die from redwater or gall-sickness when sold. Such management does not of course make for great scale, but as is seen on many farms in most districts in the country, the progeny of the Edwaleni bulls are as big as the local grazing conditions permit. In addition to the pure-bred bulls, a large number of grade bulls are sold each year to ranchers and others, and until last year the grade steers were sold as yearlings.

Mr. Gwynn's attention was first called to the breed by the late Mr. John Thornton, the well-known English cattle auctioneer, and after a year in Rhodesia he concluded that there are two things essential in a breed which is to be used in grading up African cattle. One is that the size should be in keeping with the average grazing conditions of the country—which are medium—and that the animal should be hardy and active—a grazing breed in other words. The second is that it should be a "dual-purpose" breed, to give to the grade females sufficient milk to raise a big thrifty calf, a quality notably lacking in African cattle and in some of the "special-purpose" breeds.

Enquiries in the two Americas and in Australia confirmed Mr. Thornton's advice, and, as stated, the first Devons were bought in 1908. Mr. Gwynn says that nothing which he has seen in Africa makes him regret his choice of breeds. To meet the great demand for Devon bulls, a number are bought each year from breeders in the Union, and when acclimatised are sold here.

Statistics of Crops grown by Europeans in Southern Rhodesia

FOR THE SEASON 1918-19.

By F. EYLES, F.L.S., Statistician.

Introductory.—The usual tabular statement and subsidiary tables of the crops grown last season are presented herewith. The opportunity is convenient for saying that the preparation of these figures would be impossible without the ready assistance of all the farmers, and in respect to accuracy of details and punctuality of publication, the Statistician is entirely in their hands. With regard to accuracy, the internal evidence shews that little fault can be found. For instance, in June, 1919, the maize crop was forecasted in this office as 897,000 bags from 172,000 acres and now proves to be 890,000 bags from 173,000 acres, the forecast being based on information supplied by the farmers, a sufficient proof that they are consistent in their returns. There is no reason to doubt the correctness of the figures given for crops harvested, but it has been suggested that in some instances the measurements of land cultivated are guesswork. This may be so with a small proportion of the farmers, but a comparison of the total acres under each crop or cultivated in each district from year to year indicates that this error is not common enough to vitiate seriously the main totals. It is proposed to publish in the next issue of this *Journal* a short note on some simple methods of measuring land.

In the matter of punctuality of publication the position is not so satisfactory. During the first week in September, 1919, blank forms for crop returns were distributed to all farmers with a request that they should be completed and sent in by the 15th of that month. Approximately three-quarters of the papers came in promptly. The remaining one-quarter took a full four months to straggle in to this office, and then only after the issue of hundreds of circulars requesting compliance with the law, and in a few cases the despatch of urgent letters pointing out the penal clauses of the law. No complaint is made of the unnecessary work thus entailed, but it is well that those farmers who are so often defaulters through pure thoughtlessness should realise that, of all the tables published to-day, not a single total can be added up nor a column entered nor a solitary percentage worked out until the last return is to hand. The consequence is that the summarising and comparing of results have to be done hurriedly, and what is more serious, the delay in publication gives scope for manipulation of the market in important crops like maize and wheat, a manipulation injurious to the country and seldom of benefit to the farmer.

General.—A cursory examination of the tables is sufficient to reveal two striking features of the season under review—1918-19. The first is a general reduction in the amount of land under tillage, and the second is an equally general increase in the acre-yield of all principal crops. The fall off in acreage was due to the unfortunate incidence of the influenza epidemic in the planting weeks of 1918, when, not only were many farmers incapacitated, but the native labour supply was seriously depleted, so that much land already prepared for seed could not be planted. Heavy, scouring rains a little later in the season also had an appreciable effect in still further diminishing the area under crops. In spite of the latter climatic drawback, the seasonal conditions as a whole were good, as seen in the all-round improvement of acre-yield. It may, therefore, be fairly argued that, but for the interference of influenza with farming operations, the season 1918-19 would probably have been a record one.

CEREALS, LEGUMES, ETC.

Of all land under cultivation, 89.7 per cent. was devoted to this class of crop, leaving only 10.3 per cent. for the other classes, including tobacco.

Maize.—If we add to the 173,313 acres on which maize-for-grain was grown the 5,619 acres set aside for maize-for-silage, we get a total of 178,932 acres under this single crop, equal to no less than 87.9 per cent. of all land cultivated. The harvest of grain was an excellent one, but had been surpassed on two previous occasions, once in 1914-15, and again in the record season of 1916-17, but in the latter instance it was reaped from a much larger area. The yield per acre was 5.13 bags for the whole country, and only once before has a better acre-yield been secured, namely in 1914-15, when it was 5.47 bags per acre. As stated last year, the bulk of maize is produced in five districts, viz., Mazoe, Salisbury, Hartley, Lomagundi and Gwelo, and this season over 75 per cent. of the maize crop came from these districts. The maize belt, properly so called on account of soil productivity, would appear to be embraced by the three districts of Mazoe, Salisbury and Lomagundi, which in the season 1918-19, taken together, yielded an average of 6.5 bags per acre.

Record of Maize Production for Six Years.

Season.	Acres.	Bags.	Yield p.a.
1913-14	161,268	634,133	3.93
1914-15	167,012	914,926	5.47
1915-16	174,647	680,285	3.88
1916-17	203,150	938,130	4.62
1917-18	192,148	591,722	3.08
1918-19	173,313	889,969	5.13

Wheat.—The production of wheat was about the same as the previous season, but from a smaller area. The average acre-yield for the Territory for summer and winter wheat together was 3 bags. Over 65 per cent. of all wheat was raised in four districts, namely, Charter, 2,878 bags; Chilimanzi, 2,728 bags; Melsetter, 1,866 bags; and Umtali, 1,311 bags.

Other Crops.—The remaining crops under this heading call for little remark beyond saying that they all shew a decrease of acreage, but with one exception so far as recorded, an increase in the acre-yield compared with the previous season. The acre-yield for buckwheat was unchanged. Ground nuts occupied 28 per cent. less land than the previous year, which is surprising considering the strong market there is for this product.

SUCCULENTS AND ROOT CROPS.

The same general observation applies to this class, that is acreage reduced but yield improved. The exception was pumpkins, the area under crop being higher, but with a lower acre-yield. The most notable case of decrease is that of potatoes, the land under this crop being 37 per cent. less than the previous season. The cause of this shortfall is ascribed to the difficulty farmers had in obtaining seed.

FODDERS.

Napier fodder, being a perennial, holds its own, and shews a slight increase of land given to it. All the other fodder crops shew appreciable decreases, and teff grass occupied only one-half as much land as in the previous season.

TOBACCO.

For the season 1918-19 tobacco stands alone as the only important crop which made a real advance, both as to amount of land devoted to it and as to acre-yield. In 1917-18 there were 3,247 acres under tobacco, and 4,197 acres in 1918-19, an increase of no less than 60 per cent. The average yield of Virginia and Turkish leaf taken together was 350 lbs. per acre, compared with only 179 lbs. the preceding season, an advance of over 95 per cent. The production of Virginia was 369 lbs., and of Turkish 288 lbs. per acre.

In the season 1913-14 over three million pounds of tobacco were produced, but the next year saw a sudden collapse of the industry. In 1918-19 the million pound mark has again been reached and passed, and there is no doubt the quality of leaf produced has much improved, so that the outlook of the industry is now bright, and its importance to the country very great. The following table shews how steady is the recovery of this industry.

Tobacco.

Season.	Acres.			Yield (pounds).		
	Virginia.	Turkish.	Total.	Virginia.	Turkish.	Total.
1913-14 ...	...	...	5,627	...	...	3,061,750
1914-15 ...	...	...	1,370	...	...	426,423
1915-16 ...	...	...	1,310	...	...	637,261
1916-17 ...	...	...	1,995	...	...	910,684
1917-18 ...	2,434	813	3,247	415,210	204,961	620,171
1918-19 ...	3,198	999	4,197	1,179,932	287,680	1,467,612

SUNDRY CROPS.

A total of 641 acres of land under crops other than those in the schedule was returned. This was probably not a complete return, but an analysis of the figures is instructive and indicates in what directions there is a movement towards increasing the variety of crops grown. It will be seen that 446 acres were given to the two native grains poko and munga, and 70 acres to various grasses, many of them native.

	Crop.	Acres.	Total.
CEREALS, LEGUMES, ETC. ...	Poko	386	
	Munga	60	
	Peas	28	
	Rice	13	
	Kaffir beans ...	10	
	Emmer wheat ...	6	
	Tonga bean ...	2	
			505
SUCCULENTS AND ROOT CROPS	Field radish ...	2	
	Swedes	1	
	Chicory	1	
	Carrot	1	
			5
FODDERS	Sudan grass ...	28	
	Kikuyu grass ...	27	
	Paspalum grass ...	8	
	Native grass ...	3	
	Molasses grass ...	2	
	Mfufu grass ...	2	
	Rape	1	
			71
VARIOUS	Unspecified ...	54	
	Cotton	5	
	Broom corn ...	1	
			60
			641

CITRUS ORCHARDS.

The following table is a summary of the different kinds of citrus trees planted :—

	Trees bearing.	Not bearing.	Totals.
Oranges	51,517	76,577	128,094
Lemons	8,846	4,667	13,513
Limes	378	266	644
Naartjes	5 595	1,694	7,289
Grape fruit	1.049	739	1,788
Pampelmoes	283	136	419
Totals ...	67,668	84,079	151,747

TABLE I.

Districts in order of Acreage of Cultivated Land.

District.	1915-16.		1916-17.		1917-18.		1918-19.	
	Acres.	Sequence.	Acres.	Sequence.	Acres.	Sequence.	Acres.	Sequence.
Mazoe ...	46,282	1	57,622	1	58,839	1	64,279	1
Salisbury ...	42,332	2	45,939	2	41,622	2	33,166	2
Hartley ...	21,269	3	25,171	3	23,876	3	17,489	3
Lomagundi ...	12,272	4	17,392	4	18,096	4	15,533	4
Gwelo ...	11,939	5	17,072	5	16,274	5	15,525	5
Insiza ...	6,017	8	8,584	7	5,785	8	5,904	6
Marandellas ...	7,106	7	8,342	8	7,538	7	5,670	7
Makoni ...	8,335	6	9,557	6	8,163	6	5,614	8
Victoria ...	2,569	17	4,362	15	5,225	11	4,154	9
Charter ...	4,123	12	5,967	10	4,552	13	4,094	10
Chilimanzi ...	3,561	14	4,885	13	5,312	10	3,942	11
Nyamandhlovu...	4,154	11	4,644	14	3,115	16	3,500	12
Bulawayo ...	2,737	16	3,921	16	3,469	15	3,438	13
Bubi ...	3,763	13	5,070	12	3,524	14	3,315	14
Bulalima-Mangwe	4,430	10	6,776	9	5,627	9	3,281	15
Umtali ...	4,986	9	5,093	11	4,728	12	3,074	16
Matobo ...	2,241	18	3,246	17	2,652	17	2,129	17
Melsetter ...	2,088	20	2,833	18	2,410	18	2,006	18
Ndanga ...	797	25	1,055	24	1,056	23	1,559	19
Selukwe ...	2,123	19	2,722	19	1,212	21	1,376	20
Mrewa ...	1,687	22	2,127	20	1,233	20	1,211	21
Gutu ...	1,142	23	1,505	22	1,151	22	1,180	22
Wankie ...	1,874	21	1,150	23	1,376	19	1,081	23
Umzingwane ...	2,758	15	1,821	21	978	24	951	24
Gwanda ...	1,055	24	694	25	762	25	653	25
Darwin ...	95	28	399	28	492	26	590	26
Belingwe ...	611	26	516	27	434	27	424	27
Inyanga ...	600	27	529	26	335	28	183	28
Mtoko ...	...	30	34	29	92	29	98	29
Chibi ...	...	29	10	30	25	30	20	30
	202,946	...	249,038	...	229,953	...	205,439	...

TABLE II.

Cultivated Land—Crops.

Crop.	Acres.	Acre-yield.				
		1919.	1918.	1917.	1916.	1915.
Maize (grain)	173,313	5·13 bags	3·08	4·62	3·88	5·47
Maize (silage)	5,619	2·3 tons	2·2	2·0	...	...
Wheat	4,394	3·0 bags*	2·0†	2·0†	2·9*	3·6*
Tobacco	4,197	350 pounds	179	456	486	309
Pumpkins	2,325	1·9 tons	2·5	2·18	...	...
Beans	2,155	1·4 bags	1·0	1·9	1·4	...
Cattle melons	1,895	2·6 tons	1·0	3·67	...	...
Ground nuts	1,706	6·2 bags	2·8	6·3	7·36	6·87
Potatoes	1,601	21·7 bags*	12·4†	14·0†	20·4*	24·4*
Oats	1,485	...	...	...	...	...
Teff grass	1,120	...	...	...	...	...
Napier fodder	972	...	...	...	...	...
Kaffir corn	682	1·9 bags	1·0	1·8	1·8	1·8
Sundry crops	641	...	...	...	...	...
Sunflower	585	3·6 bags	2·2	3·3	5·6	5·6
Sweet potatoes	499	...	...	...	...	...
Buckwheat	498	1·7 bags	1·7	2·6	1·6	...
Millets	367	...	...	...	...	...
Velvet bean	299	...	...	...	...	...
Barley	283	...	...	...	...	...
Rye	262	...	...	...	...	...
Cowpea	150	...	...	...	...	...
Dhal	119	...	...	...	...	...
Onions	112	...	...	...	...	...
Lucerne	88	...	...	...	...	...
Mangels	38	...	...	...	...	...
Linseed	34	...	...	...	...	...
	205,439					

* Summer and winter crops.

† Summer crop only.

TABLE III.

Acreage in relation to Class of Crop.

Class.	Crop.	Acres.	Total acres.
CEREALS, LEGUMES, ETC. ...	Maize (grain) ..	173,313	
	Wheat ...	4,394	
	Beans ...	2,155	
	Ground nuts ...	1,706	
	Kaffir corn ...	682	
	Sunflower ...	585	
	Sundry ...	505	
	Buckwheat ...	498	
	Rye ...	262	
	Dhal ...	119	
	Linseed ...	34	
			184,253
SUCCULENT AND ROOT CROPS	Maize (silage) ...	5,619	
	Pumpkins ...	2,325	
	Cattle melons ...	1,895	
	Potatoes ...	1,601	
	Sweet potatoes	499	
	Mangels ...	38	
	Sundry ...	5	
			11,982
FODDERS	Oats ...	1,485	
	Teff grass ...	1,120	
	Napier fodder...	972	
	Millets ...	367	
	Velvet bean ...	299	
	Barley ...	283	
	Cowpea ...	150	
	Lucerne ...	88	
	Sundry ...	71	
			4,835
VARIOUS	Tobacco ...	4,197	
	Onions ...	112	
	Sundry ...	60	
			4,369
			205,439

The Hydraulic Ram.

By A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.,
Government Irrigation Engineer.

Although hydraulic rams are a comparatively old invention, there is perhaps no piece of hydraulic machinery about which so much obscurity exists in the public mind. Their utility for pumping water and low cost of maintenance and upkeep render them especially suitable for water supplies on farms and other places where very large quantities are not required. The ram is in reality a self-acting pump, in which the momentum of a stream of water falling a small height is utilised to raise a portion of the water to a greater height.

Let h = Height in feet the water falls to ram.
,, H = Height in feet to which the water is lifted.
,, W = Weight of water in pounds per second descending to ram.
,, w = Weight of water in pounds per second lifted by ram.
,, e = Efficiency of ram.

Then theoretically Wh should equal wH.

In practice, however, owing to pipe friction, slipping of valves and loss of water in the operation of the ram, this result cannot be attained, and the actual water raised through a height H will be—

$$w = \frac{e \times W \times h}{H}$$

Referring to Fig. 1, the operation of the ram may be briefly described as follows:—Water is supplied from a tank or stream through a drive pipe A into a chamber B, which has two valves V and V_1. When no flow is taking place valve V is open and V_1 closed. If water now flows along the pipe A it will escape through the open valve V. As the water passing through V increases in velocity, the impact on the underside of this valve causes it to lift and suddenly close. The rapid closing of the valve causes a "kick" or water hammer in the pipe, and there is a sudden rise of pressure in B, which causes the valve V_1 to open and a portion of the water passes into the air vessel C. The kick, or hammer, transmitted through the ram is overcome by the greater pressure in the pipe D, and a re-action or backward pulsation is set up which closes valve V_1 and unseats valve V. The cycle of operations is then repeated, more water being forced into the air chamber C, in which the air is compressed, and the water is forced up the delivery pipe D to the desired height. The backward pulsation or recoil is utilised to draw air through a small valve S opening inwards only, and called a snifting valve, which replenishes the air vessel and prevents it becoming water-logged.

It may be generally stated that the efficiency of a ram decreases as the lift or head H increases, as will be seen from* Table I., which sets out the percentage efficiencies for the various ratios of lift to fall, also the percentage lifted of the water supplied to the ram.

TABLE I.

Ratio of lift	H	3	5	8	10	15	20
to fall	h	1	1	1	1	1	1
Efficiency		77%	67%	55%	48%	34%	22%
Percentage lifted of water supplied to ram		25	13	6	5	2	1

There are several types of rams on the market, for which high efficiencies are usually claimed by the makers. Rams of different size and make perform differently; it is therefore advisable in carrying out installations to follow closely the instructions issued by the manufacturer concerned. Rams of varying sizes can be operated over a wide range of conditions, with flows ranging from 2 to 120 gallons per minute, and a working fall of from 3 to 50 feet. It is, however, usually not desirable to operate under a fall exceeding 20 feet owing to the wear and tear of valves, etc. As a general rule 1 foot of fall will be required for each 7 feet of lift above the ram. Varying the length of the drive pipe has the effect of altering the number of beats per minute of the ram, and manufacturers usually state the length required for specific cases. In Table II. are given† details of proportionate head of fall giving highest efficiency in the operation of hydraulic rams.

TABLE II.

To deliver water to a height of	Place ram under	Conducted through
20 feet above ram	3 feet head of fall	30 feet of drive pipe
30 ,, ,,	4 ,, ,,	30 ,, ,,
40 ,, ,,	5 ,, ,,	40 ,, ,,
50 ,, ,,	7 ,, ,,	50 ,, ,,
60 ,, ,,	8 ,, ,,	60 ,, ,,
80 ,, ,,	10 ,, ,,	80 ,, ,,
100 ,, ,,	14 ,, ,,	100 ,, ,,
120 ,, ,,	17 ,, ,,	125 ,, ,,

Journal of Industries — *S.A. Journal of Industries*, p. 137 (February, 1919).

†Gould's Manufacturing Company.

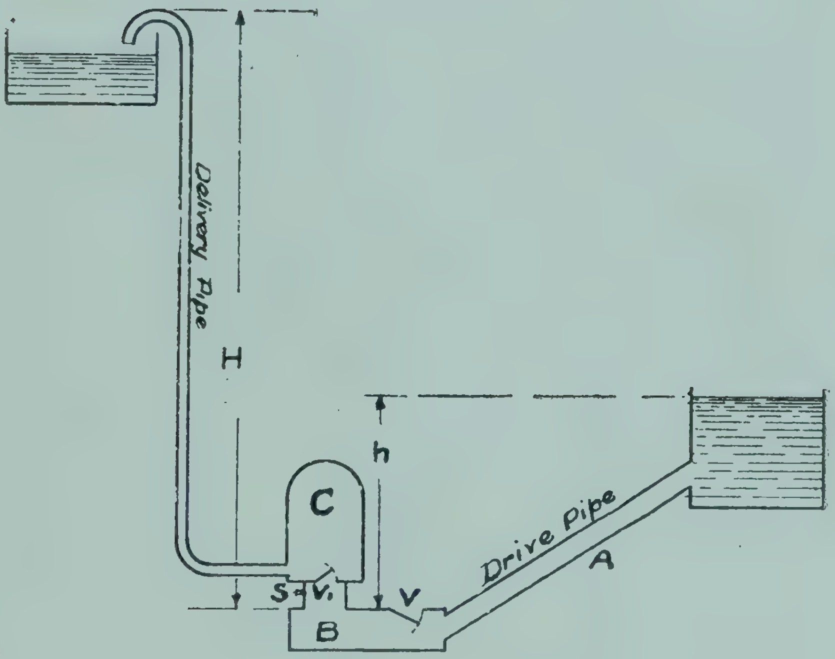

Fig. 1.

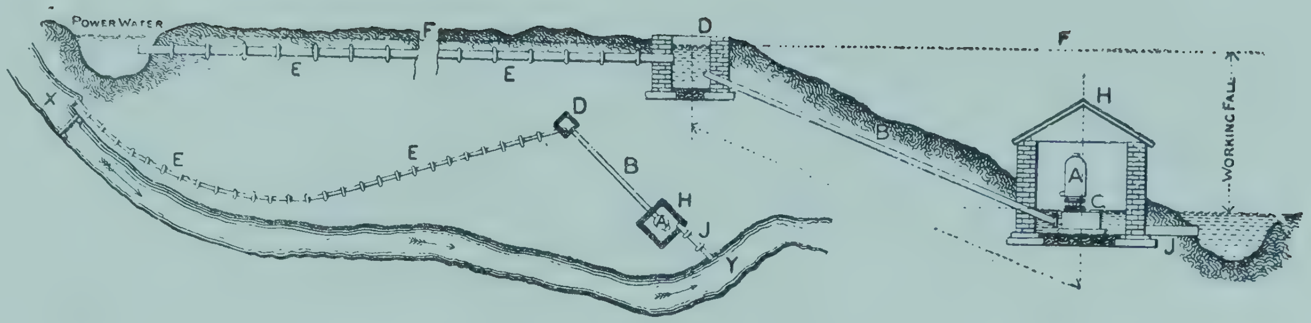

Fig. 2. A, the ram; B, drive pipe; D, feed tank; E, open channel or pipe line; H, the ram house; J, waste water outlet pipe.

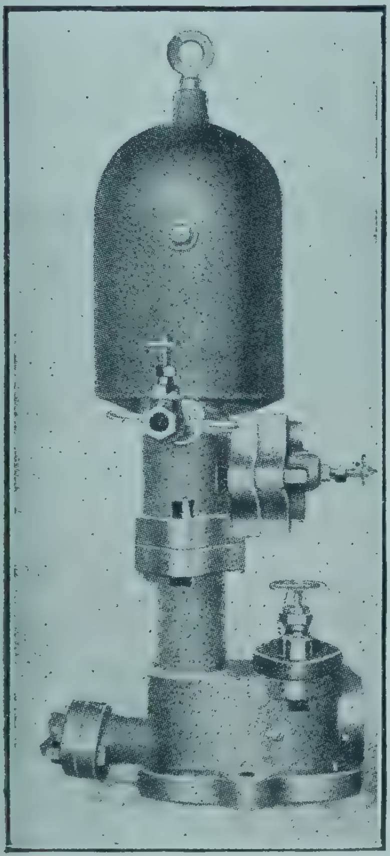

Fig. 3. Blake's patent hydraulic ram.

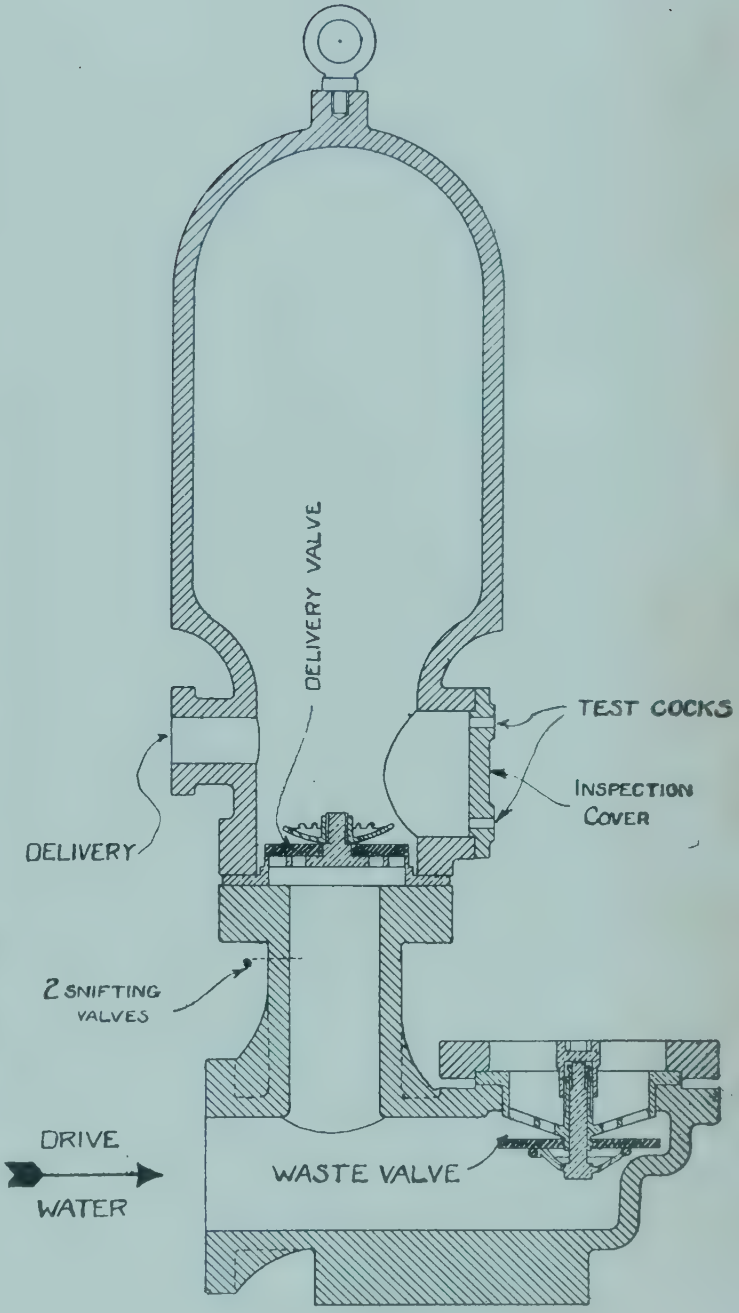

Fig. 4. Cross section of Blake's ram.

Rams can be arranged to operate in conjunction with various sources of supply, but the most common cases are those where a small natural stream having a moderate fall or an irrigation furrow is available. In the former case a small weir or dam can usually be placed across the stream and the water led out by means of an open channel or pipe line to a point where the requisite fall can be obtained direct to the ram, as illustrated in Fig. 2.

Where an irrigation furrow is conveniently situated to give the fall necessary to operate a ram, the installation is a comparatively simple matter. The drive pipe, which must have its intake end suitably protected, can be taken direct from the furrow and carried down to the ram, from whence the delivery pipe can be led to an overhead storage tank or other elevated point as desired. In certain cases the ram could be operated at night or at such times when the water in the furrow is not required for irrigation. Rams must be firmly bolted down upon a concrete foundation and a drain provided for carrying off the waste water from the escape valve. It is not advisable to place rams in river beds, where they may become inundated during times of high flood.

In Fig. 3 is given an illustration of a Blake's ram* with a cross section of same in Fig. 4. In most cases the diameter of the delivery pipe is about half the diameter of the drive pipe, but it should be increased in size where the length of the former is considerable. In considering the water available in a stream or spring, the minimum flow should determine the size of the ram, otherwise one may be selected which is too large to be actuated by the dry weather flow.

Where water can be diverted for irrigation from a river by means of a gravitation furrow, it would not in the ordinary way be economical to lift water by a ram, although in certain cases batteries of rams capable of pumping quantities of water up to one quarter million gallons per diem have been installed with success, yet their function on the farm is limited more to providing supplies for domestic and stock purposes up to 25,000 gallons per diem. A large sized ram delivering into a storage tank could be used for the irrigation of a garden or small area of about 20 acres, in which case the tank should have sufficient capacity to contain at least four to five days' supply delivered from the ram.

Farmers and others contemplating the erection of a ram in any but the most straightforward cases would be advised to first seek professional advice.

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*By permission of Messrs. Stewarts and Lloyds.

Afforestation in Zululand.

By J. S. Henkel, Forest Officer.

The writer, previous to his transfer as Forest Officer to the Rhodesian Administration, held the appointment of Conservator of Forests, Natal Conservancy, which included Zululand.

In Zululand, within the parts set aside for European occupation, considerable progress has in recent years been made in afforestation, both by the Government and private individuals. While at some few centres, such as Eshowe, various magistracies and mission stations, exotic trees had been planted, it was not until about 1904 that a Government experiment station was established at Empangeni. Besides testing various rubber and fibre producing plants and trees, fruits, etc., a large variety of forest trees was planted.

Empangeni is 122 miles from Durban, with which it is connected by railway. The indigenous vegetation in the locality consists, in undisturbed areas, of scattered thorn trees (acacias) of poor growth and usually much disfigured by salt-ladened south-east winds. The grass is rank and coarse. The soil varies from a red loam of granitic origin to a poor sand, originally moving dunes of strand origin, but reclaimed by grasses. The average rainfall is about 40 inches, falling principally in the summer months. The elevation varies from 100 to 200 feet above sea level. In late summer the temperature is high. Even at 11 o'clock at night the writer has noted a temperature of 89 deg. Fahr. No frosts occur in winter, with the result that the veld seldom has a dry appearance. White ants abound, but have not proved a menace to tree growth.

Judging by the indigenous vegetation and the bad effects of strong winds, conditions appeared far from favourable for the growing of exotic timber trees. Numerous were the prophecies that all attempts to grow forest trees would end in failure. While it is true that some species of trees proved unsuitable for the locality, yet quite a large number have adapted themselves to the conditions, have developed fine stems, excellent height growth and first-class timber. In some cases self-sown seed germinates freely and develops into the sapling stage, ready, if desired, to take the place of the parent trees.

With a few exceptions the various kinds of conifers have not been a success. Of great promise, however, is *Araucaria cookii*. Such species as *Pinus pilustris, Pinus tæda, Juniperus Bermudiana* and *Cupressus sempervirens*, while likely to make fair growth, will always be expensive species to grow by reason of the difficulty of keeping them free from weed growth during the first five years of their life. Of all the conifers tested so far, *Araucaria cookii* seems the most suitable. No doubt it would be cultivated on a much larger scale were it possible to obtain seed. The Empangeni trees have recently flowered for the first time, and the probabilities are that an abundant supply of seed will be available within the next few years.

The outstanding successes were secured with Eucalypts. So many adapted themselves to the conditions that there is a difficulty in deciding which are the best kinds. Amongst the successful ones are the following:—*Eucalyptus saligna, E. paniculata, E. maculata, E. corymbosa, E. pilularis, E. resinifera, E. citriodora, E. microcorys* and *E. botryoides.*

The Empangeni plantation has an area of about 700 acres, with fairly evenly distributed age classes. The thinnings from the young stands find a ready sale, and there is no doubt that when the timber is mature a handsome return will be obtained on the capital invested.

When it became apparent, from the Empangeni results, that forest trees would grow in the coast belt of Zululand, the farmers and cane planters were not slow in following the Government's lead, and no visitor to Zululand to-day can fail to be impressed by the pleasing appearance of the countryside. The plots of trees surrounding the homesteads, the avenues along the roads and the windbreaks indicate prosperity and permanent occupation, and from an æsthetic point of view form delightful contrasts to what seems limitless areas of cane.

With the increased prosperity that has come to the country tree planting has received a great fillip, and with the prosperous port at Durban, within reasonable distance, and the industries being established there, the demand for all classes of timber becomes greater from year to year. The successes met with at Empangeni induced the Union Government to embark upon a larger afforestation scheme on land situated about nine miles nearer Durban, namely, a tract of sandy country lying between the Umhlatusi and Umlalusi Rivers, in extent about 10,000 acres. The whole scheme will cost about £100,000. Already 1,000 acres have been planted. A railway traverses the country for a distance of nine miles. Besides this proposition there are others under consideration. These schemes are not philanthropic institutions, but commercial propositions which are in themselves sound, and from a national point of view desirable in every way, since a commodity is produced, an abundant supply of which is so essential for the prosperity of industries and the general advancement of the country.

It is probable that many of the trees mentioned have been planted in Mashonaland, and to enable comparisons of growth to be made the following measurements are given:—

Eucalyptus saligna.—Age, 14 years; original espacement, 10 ft. by 10 ft; average height, 95 ft. Nine trees measured along an average row gave the following diameters: 11 in., 13 in., 13 in., 11 in., 11 in., 10 in., 13 in., 12 in., 14 in. In forestry practice diameters or girths of standing trees are always taken at $4\frac{1}{2}$ ft. (chest height). Individual trees are often larger than the diameters mentioned above. For example, in November last a tree 13 years old was felled; its total height was 95 ft., girth 45 in. (at $4\frac{1}{2}$ ft.); cubic contents, including bark, but excluding branches, 42 ft., without bark 35 cubic ft. From this tree a spar 50 ft. long with 8 in. top diameter was cut and used for hoisting a five ton cauldron to the third storey of a sugar mill.

Eucalyptus pilularis.—Age, 13 years; original espacement, 10 ft. by 10 ft.; average height, 90 feet. The diameters of 13 trees adjoining one another were 14 in., 12 in., 13 in., 11 in., 14 in., 13 in., 10 in., 13 in., 12 in., 12 in., 13 in., 9 in., 12 in.

Eucalyptus maculata.—Age, 11 years; original espacement, 10 ft. by 10 ft.; average height, 60 ft. Typical diameters are:—8 in., 5 in., 7 in., 9 in., 9 in., 11 in., 7 in., 9 in., 8 in., 6 in., 8 in., 8 in., 10 in., 8 in., 9 in., 9 in., 8 in.

Eucalyptus corymbosa.—Age, 11 years; original espacement, 10 ft. by 10 ft.; average height, 65 ft. Typical diameters are:—12 in., 11 in., 9 in., 9 in., 9 in., 10 in., 11 in., 10 in., 11 in., 10 in., 7 in.

Eucalyptus paniculata.—Age, 11 years; original espacement, 10 ft. by 10 ft.; average height, 70 ft. Typical diameters are:—9 in., 9 in., 11 in., 11 in., 11 in., 7 in., 10 in., 10 in., 7 in., 10 in., 10 in., 11 in.

Eucalyptus resinifera.—Age, 8 years; original espacement, 5 ft. by 5 ft.; average height, 50 ft. Typical diameters are:—6 in., 7 in., 4 in., 6 in., 6 in., 6 in., 6 in., 6 in., 7 in., 6 in.

Eucalyptus corynocalyx.—A 11 year old stand had trees approximately the same size as *E. paniculata* of the same age.

Araucaria cookii.—Age, 14 years; original espacement, 20 ft. by 20 ft.; average height, 35 ft. Typical diameters:—14 in., 10 in., 9 in., 11 in., 8 in., 9 in., 6 in., 7 in., 10 in., 8 in., 9 in., 9 in.

With the exception of *Araucaria cookii*, which were planted at a wide espacement to induce early seed production, all the other trees are in true forest form of having closed canopy.

To realise the rate of growth of exotic trees in Southern Africa a comparison with some of the European forest trees will not be without interest, thus: oak grown on the Continent under the best conditions at the age of 70 years has an average diameter of 11.4 in. and a total height of 86 ft. At the same age—

Beech averages 9.5 in. diameter and 76 ft. high.
Scotch pine averages 10.4 in. diameter and 80 ft. high.
Spruce averages 11.1 in. diameter and 85 ft. high.
Silver fir averages 9.6 in. diameter and 71 feet high.

Cave of 'Mlimo.

By A. Leslie, Duta, Matopos.

This cave is situated on the southern fringe of the Matopo Hills at a point some five miles north-west of the Ove River drift. It forms part of what is really a natural amphitheatre high up in a kopje that to the casual visitor looks quite solid and similar to the hundreds of others that surround it. It is separated from Njeleli, one of the highest peaks in the range, to which various legends are attached, by a steep rocky defile, which is so overgrown with vegetation as to be almost impassable. There are three entrances to this amphitheatre, but all are naturally well concealed, winding up and down amongst the boulders and overhanging rocks. When I visited it first the natives were there in considerable numbers, and it was their singing and shouting that led me to stumble on the entrance. After peering over a rock for some time at them, I was discovered and the alarm given. They instantly fled like rabbits, and I was inclined to do likewise. However, some of the local boys recognised me and came forth, and after confidence being restored the interrupted ceremony was resumed, dancing being indulged in at high pressure to the music of drums and singing, clapping of hands, and shaking of calabashes containing some small seeds resembling peas. The object was, I understand, to supplicate the 'Mlimo for rain, it being a prolonged dry spell at the time. Many of the natives come long distances for this purpose, bringing their food and staying there for a week and sometimes longer. Sleeping accommodation was found at the numerous rude huts that are scattered about, or under the overhanging rocks.

It was a few weeks after my first visit that I went there again, but on this occasion there were no natives there, the ceremony being over. I think it had rained in the interval. Anyhow, my attention was attracted to a barricade of long poles carefully barked and placed across a narrow opening in the rocks. Looking through them, I saw some bones and horns lying around. Pushing aside the poles, I crawled in and found that there were a great number of skulls and horns of big game of almost every variety. Some must have been exceptionally fine, but all are more or less decayed now. The only ones in a good state were, I think, two rhino tusks and a small elephant tusk. In a gallery leading off this there were several stacks of the usual kaffir hoe, all of native manufacture I believe. The hoes were arranged in small piles about 18 inches high, and as there were about six of these altars, the hoes must have numbered about a hundred. Near to these were several kaffir pots containing water. This was fresh and clean and looked as though it were renewed frequently. Another offering was piles of native tobacco, also an odd pot containing some cloth and beads. Further exploration revealed a few native-made hatchets, assegais and spears, and since my visit I believe two or three guns were recovered by the police, acting on information received from a native and guided by him.

This occurred about two years ago, but I believe I was the first white man to enter the cave or witness the rain-invoking indaba. The main gallery is not really a cave, being merely a cleft in the rocks open to the sky, the walls rising sheer and straight for upwards of a hundred feet, narrow at the entrance, and with several tunnels or smaller chambers leading off it. Beyond the carefully prepared stockade at the entrance, there appears to have been no attempt at decoration or improvement in any way. All of it, with the exception of the chamber containing the hoes, etc., which seemed to have been swept out and kept tidy, was littered with leaves and earth. I have on several occasions tried to get information from the natives as to what they believe in regard to the 'Mlimo. Some say they hear a voice, but the majority give an evasive answer, and beyond what I have seen I could not give any definite facts about their beliefs and customs. It appears to me, however, that the majority of them do not really put much faith in going there at all. It seems to be more or less a tradition, and the rising generation are inclined to treat the matter as an outing rather than as a serious business. For a considerable time after the police visited the cave the natives would not go there, believing they would be arrested, but recently there has been a renewal of the ceremonies.

I might mention that I frequently have seen troops of young girls with their bodies painted with white stripes passing *en route* to Njeleli for something of the same nature. They dance all the way—it may be ten to fifteen miles—but these usually return the same day.

Lincoln Red Shorthorns.

THE SAUERDALE HERD.

On the farm Chabalala, seven miles from Bulawayo, Mr. John Brebner has, during the last five years or so, been gathering together a herd of pure-bred Lincoln Reds which bear as a prefix to their names in the stud book the registered word "Sauerdale." This title is likely to become well known in the cattle-breeding world of Rhodesia as standing for a family of exceptional merit and substance. Mr. Brebner has spared neither pence nor pains in establishing a high-class herd, and he has already been well rewarded for his enterprise and trouble. Originally importing really high-class heifers from well-known breeders at Home, he has used with discrimination and success locally bred and imported bulls, and has frequently changed these as circumstances required or opportunity offered. He has also added to the herd a few fully registered South African-bred cows, and has bred and kept a number of heifers, so that the pure-bred herd is now one numbering in all 25 head, of which 12 are mature pedigree cows and the rest bulls, heifers and calves. From these there will annually be available for sale a certain number of young bulls of very exceptional quality. The young stock recently examined shew remarkable growth and vigour, and promise to develop into great framed, strong, shapely, vigorous animals; for Mr. Brebner believes in good blood, good food and plenty of it.

The young bull "Sauerdale Commonwealth" (510), at the age of eighteen months, is a fine specimen, and is likely to make a great bull. He is well grown out, deep, fleshy, shapely and full of character. It is of interest to note that he is not only bred in the country, but is also sired by a Rhodesian bull, "Westacre Cromwell" (449), bred by Mr. E. A. Hull, though his dam is an imported cow, "Bracebridge" (43).

Mr. Brebner is now importing at considerable cost yet another bull, "Fathwell Favourite," from which he expects great things.

As shewing what the grade stock sired by bulls of this class are capable of doing, it may be mentioned that at the last Bulawayo Show in September Mr. Brebner's fine Lincoln Red grade oxen carried off the Liebig Cup and the prize of £50 for the best five bullocks under six teeth. These averaged a live weight of 1,382 pounds and sold in Bulawayo for £23 10s. each, whilst one pair of them scaled 1,430 pounds apiece and took the second prize for Shorthorn grades under six teeth. Thus it may be seen that both pure-bred and grade stock of the best class are bred and fed at Chabalala.

Maize Notes.

By F. C. Peek, Teign Farm, Concession.

In past years Boone County, Golden Eagle, Champion White Pearl and Iowa Silver Mine have all been tried on this farm, and are undoubtedly susceptible to blight, but I have found Salisbury White is not nearly as badly attacked as ten years ago. I had congratulated myself that I had entirely eradicated the disease through careful selection, but with rainfalls of nearly 50 and 45 inches respectively during the last two seasons, I found I was mistaken, and blight was still present, although not anything like as seriously as in previous years. It was present also in Hickory King, but not to any great extent; this may be partly accounted for by that variety being grown on higher and better drained land.

I only grew Golden Eagle for two years, and in my experience and that of others in the district, neither Salisbury White nor Hickory King, in spite of blight, have ever equalled it for filling the bag. I believe I am right in saying that it was discarded owing to an embargo of 2s. 6d. per bag being placed on it by the Farmers' Co-operative Society, since it was considered likely to be detrimental to grow both white and yellow maize on the maize belt. I believe also that millers objected to it, and that natives on mines demanded white meal.

It is undoubtedly a fact that the Salisbury White is, in an average season, a heavier yielder on certain rich black soils (I estimate it at least two bags an acre more). On my farm Hickory King has badly failed me on soil that, except for the last two exceptionally wet seasons, has always given me 12 bags an acre when planted with Salisbury White. On the other hand, on red soils, I find that Salisbury White gives a good return on new land, and for two or three seasons after breaking up, but after that with me Hickory King seems to do better, even when the land has been fertilised and has had a change of crop. During the last two seasons much of the best Salisbury White land has been swamped, and this certainly accounts for its deterioration on many farms.

There is undoubtedly a tendency on the part of what may be called Boone County strains of Salisbury White to throw back to the Boone type with a more or less greater number of rows than twelve. For the last three or four years I have thrown out all seed cobs above that number, but still continue to get 20 to 25 per cent. of fourteen row, with a few sixteen and eighteen row, which appear to me to be very near the Boone County proper. At the same time, I get about 5 per cent. of ten row ears, which I have never used for seed, but which, if they could be fixed as a type, I consider would yield our ideal cob. This ten row ear is almost invariably deep and broad in grain, and in weight seems to equal twelve and fourteen row cobs.

I believe that we shall have to decide by further experiments ourselves what types can be fixed, and what best suits our own soils. From outside opinion our present maize lacks little beyond fixing the type, and when once fixed we must see that it does not deteriorate. One thing seems certain, and this is that cobs possessing good butts and tips, depth of grain, straightness of rows and weight can be got from the Boone County strain of Salisbury White, but at the same time its tendency seems to be to revert to the Boone type, especially when grown on rich land, and this results in a certain amount of chaffiness. While discarding all seed shewing marked roughness, I feel convinced that depth cannot be kept without a little of this roughness.

The Basis and Beginning of Poultry Keeping.

By A. Little, Poultry Expert.

The importance of the poultry industry in this country is rapidly becoming more widely realised, and the demand for poultry products is increasing daily. Greater production is therefore necessary, and it is gratifying to see that not only are poultry keepers increasing their stocks and output, but large numbers of people are now keeping poultry.

To make a highly successful poultry keeper the following qualities are necessary:—Business capacity, sagacity and shrewdness, capability to plan well and execute completely. How often do we find this latter quality absent? How many commence with no definite plan in view? Know what you are aiming at, draw up a detailed plan of houses, pens and work generally, and gradually add according to a fixed plan as circumstances allow and warrant. For instance, how many put up the first house and pen with no idea where the next and subsequent ones are to be placed! The result is, in time, a heterogeneous collection of houses and pens of all shapes and sizes, shewing no orderliness or tidiness, and causing great waste of time and labour in walking from one to another and attending to them. As with the houses and pens, so with the general work. There must be regularity and punctuality in feeding, cleaning and all the things necessary for the successful running of poultry.

Attention to detail is one of the most important qualifications for a good and successful poultry keeper. It is the little details that count, such as seeing that the birds have everything they require to keep them in good productive condition, clean water kept in the shade, grit, charcoal, clean nests, etc., etc.

The faculty of being able to recognise at once when a bird is off colour, whether she is laying or not, whether the chickens are thriving or not, whether they are uncomfortable or overcrowded at night, etc., is essential. Alertness is necessary in order to be able to take advantage of favourable conditions and also to prevent mishaps. There must be strict attention to work—a continual pushing forward.

It is necessary to keep accurate accounts, in order to know if the business is paying. How many poultry keepers do this? How many know what they have spent and are spending on stock, materials, houses, food, etc.? and how many know what their fowls are producing in the matter of eggs and poultry sold, and those used in the house, etc.? No business or hobby can be run successfully without accurate accounts being kept. The simplest method is a note book, on one page of which should be noted all moneys paid out, and on the opposite all received, with the value of produce used in the house. Especially necessary is it to keep accurate accounts from the very commencement, for the failure to do so is often the cause of a man losing all his money in the poultry business. He goes on buying appliances, food and other articles, many of which are absolutely unnecessary, but which he thinks are needful, yet, if he knew how matters were and that it would pay better to wait before increasing expenditure, he would save money trouble and worry. This would be far better for the industry and we should *never* hear that oft-repeated cry of "poultry doesn't pay."

In no business can economy be exercised better than in the poultry business. This is especially the case in the matter of home-made appliances, where a little ingenuity will often save the poultry keeper pounds. As in many other spheres, common sense must be used if success is to be achieved.

The causes of failure are many. Self-conceit prevents progress. The enthusiast who imagines himself a paragon, who finds no difficulties in the way and is sanguine of success will fail. There are laziness, which defeats good intentions, and negligence, which allows dirt, parasites and disease to prevail. It is wasteful to give too much food and allow it to lie about for the mice and wild birds to eat. Feeding the birds on free range is unnecessary, as they can find abundance of food for themselves. To waste the droppings instead of using them in the garden, and failure to utilise the feathers of birds killed and so on, is bad practice; all these matters count considerably in poultry keeping.

Carelessness in nullifying system, forgetfulness in omitting duties, and roughness in disturbing and distressing the birds are factors of importance. The birds should never be worried or frightened. Few know what a marked falling off in the egg output is caused thereby. Ignorance is not necessarily a failing, for this can be overcome by study and work to gain knowledge. Here it might be mentioned that study and practical work should go hand in hand with the poultry keeper. Study of the poultry Press of this and other countries keeps the poultry keeper up to date. It is not advocated that all that is written should be blindly followed; some are rather apt to do this without sifting the wheat from the chaff and without realising that conditions differ in every country. What, for instance, is good advice in England or America, may be altogether unsuitable if followed in Rhodesia, but there are many useful hints to be obtained, which, if rightly applied to the practical work in hand, will bring greater success and more profit to the poultry keeper. He must, however, before adopting them weigh the pros and cons thoroughly, for if there is one thing fatal in poultry keeping it is chopping and changing treatment and methods continually. This applies not only to the information given in the poultry Press, but even more so to that found in books. Unfortunately as yet we have no work on poultry dealing exclusively with Rhodesian conditions, an omission which it is hoped will shortly be remedied.

These faults are not necessarily crippling, provided the poultry keeper realises them and determines to overcome them, but if he does not, he is not fitted for the work, and will find that he cannot make poultry keeping or any other business pay. On the other hand, if he has the necessary qualities, is interested in the work, and is determined to do well, he will be eminently successful and will make an excellent living.

The three factors required for the poultry business are the same as those required for any other business, viz., land, capital and labour, with the advantages that much less of each is necessary to start with than in any other business, and with a prospect of much quicker returns. Further, it is a business which is well suited to persons of either sex who are physically unable or who do not desire to perform heavy manual labour, while it is also a health-giving occupation.

The land required naturally depends upon the size to which it is intended to increase the business, and this will be dealt with more in detail when treating of the different forms of poultry keeping. Suffice it to say here that if it is not the intention to grow all or nearly all the food required for the birds, comparatively little land is required, provided the poultry keeper intends going in for fowls or ducks only, or both; if turkeys are to be added more land is required, for they only do well when given a wide range.

Four or five acres will be sufficient for 800 birds, and the rearing of chicks for the maintenance of the flock, provided they are kept in moderately small flocks and the ground kept clean by cultivation and the growth of green food for the birds. Nothing sweetens the ground better or removes any taint more quickly than the growth of a green crop, and it is lack of attention to this most important detail which has been the cause of failure on the part of those who, having run a small flock successfully, increase their numbers, expecting proportionate profits. A small flock that has a good area to run on may thrive with little care, but large colonies on the same area demand much closer attention in every way if the greatest success is to be obtained. Young stock require more exercise while they are growing and developing, and do best with a good range, for so much depends upon a strong body and constitution; therefore it is necessary to have a larger area of ground if a good number of young stock is to be produced each year for sale as well as for future layers than if the poultry keeper only rears sufficient for the production of commercial eggs each year.

The most suitable land is of a dry loamy nature, well drained, with natural shade, but not so thickly covered with bush or trees as to prevent the birds having ample fresh air. A northern aspect is preferable, well above the mists or damp that are always found in a vlei or valley; in fact, 250 feet to 300 feet above is the best altitude. If the birds are higher or lower than this, the production will be less, while stamina and health will be weakened. The question naturally arises if a dry light loam is not available, what is the next best soil? In the opinion of the writer the following is the order of merit of the soils we find in this country:—

1. Dry light loam.
2. Light granite sand.
3. Heavy sand.
4. Gravel.
5. Light red soil.
6. Heavy red soil.
7. Rock.
8. Grey and yellow clay.

Each should be as well drained as possible.

A person wishing to start a new business naturally asks himself the question "What will it cost?" and many have to forego what would be a sound investment for the lack of funds. There is no important branch of animal industry that requires so little outlay as poultry, nor one from which a greater and quicker return is obtained for capital invested. A small beginning is necessary. In fact, to those about to begin poultry keeping on an extensive scale the best advice is, "Start in a moderate way and delay long enough to learn the business before much is invested"; this is the only road to success. There are so many who have invested considerable money and labour before the business was fairly well understood, and failure has been the consequent result. This is due largely to a very mistaken idea that it is easy to run poultry.

One who intends to take up poultry as a livelihood should not sink much capital in initial expenses, but should have sufficient to carry over a period of a year and a half. It is only after this period that the profits commence to shew an appreciable amount. The would-be poultry keeper who is in receipt of a salary should continue at his work for at least this period, and at the same time work up his stock and plant, concurrently learning his new business; then when it is going well and smoothly, and then only, should he give up his post.

The area of land should be limited to actual needs; economy should be exercised in buildings; while expenditure on ornamental work should be avoided. Land that is only reasonable in cost should be purchased or rented. The initial capital required, starting with a pen of one good cock and 12 good laying hens, is approximately £42, made up as follows:—

1	Cock (a breeder of good layers)	£3	0	0
12	Hens (bred from good layers) at 20s.	12	0	0
1	House	4	0	0
1	Incubator	10	0	0
	Wire netting and posts, etc.	4	0	0
6	Hens for incubating purposes	2	0	0
	Food for one year	5	0	0
	Sundries, wood, etc., for coops, etc.	2	0	0
		£42	0	0

The birds should be of one breed. A big mistake, invariably made, is the starting with two or more breeds; even the poultry keeper who knows his business does better by running only one breed. The reasons are obvious: only one treatment is necessary; there is no danger of breeds getting mixed, and producing cross-breds.

The best time to commence is at the beginning of the breeding season (March in this country), when everything should be ready to the minutest detail. Every possible chick should be hatched during the hatching season, *i.e.*, from the beginning of April to, at the latest, the middle of September, and the majority (keeping only a few of the very best) of the cockerels either killed as soon as the sex is apparent and fed to the pullets, or sold off for eating as soon as they are of marketable size. The money produced by these sales should be expended on feeding the pullets to a laying and profitable age.

The price for stock may seem to the layman high, but it is one of the items which spells success. Such stock costs no more to feed and care for than that of poor quality, and a very large percentage of the resulting progeny, if well treated, will be equally good. Another advantage is that the poultry keeper commencing with good stock continues with it, and is much better able to dispose of any hatching eggs and breeding stock he may wish to at good prices.

If it is intended to go in for eggs only, choose a breed from among one of the light varieties, *e.g.*, White or Black Leghorns, Minorcas, etc.; if for eggs and meat, a dual purpose breed should be chosen, *e.g.*, Wyandottes, Rhode Island Reds, etc., but in each case they should be obtained from as good a laying strain as possible. The same applies if meat only is wanted.

The third factor is labour. Poultry keeping is no business for the lazy individual; constant, rather than hard work, with few or no holidays, is necessary. One has to be up early in the morning, and the work will not be finished till late in the evening. There is no eight hours a day for the poultry keeper; his day's work may range from 12 to 16 hours, and unless he is able and willing to sometimes do this, he must not expect best results. This is not the case all the year round, but it is so during the hatching and rearing season.

The poultry keeper too must use his brains; if the details of his business are sufficiently studied there will be few costly errors, and labour will be reduced by convenient arrangements and labour-saving appliances.

In a country like this where native labour is used, failure is often the result of lack of proper supervision; too much is left to the native. The successful poultry keeper does all the most important work himself, and supervises that done by the native, seeing and insisting upon its being done properly. How often do we find on going into a run the drinking water dirty or conspicuous by its absence, or the birds mixed, followed by a remark from the owner, "I told Sixpence to always put in clean water, and to stop up that hole in the wire," no attempt being made to see that the order was carried out. Failure in this and similar countries can often be traced to this kind of laxity. A native can be trained to the work, and will do it well if he knows you are always on the *qui vive* for slackness. It takes time to build up a successful poultry business, but it can be done if the poultry keeper has the necessary attributes and is thorough in all his work.

METHODS OF POULTRY KEEPING.

Having discussed poultry keeping generally, we will now deal briefly with the particular phases of it. In each case the methods of starting and subsequent treatment vary somewhat, but all can be made to pay a handsome profit on capital invested, and, what is as important, simultaneously add to the production of the country.

Poultry Keeping in the Back Yard.—Under these conditions the birds must be kept constantly either in large coops with small runs attached, or in a house with a covered run attached; this is what is termed the intensive system. No attempt should be made to hatch and rear chicks; the birds should be kept solely for the production of eggs for the house and sale of the surplus; therefore there is no necessity to have a rooster; in fact, the birds lay better and do better without one, and the eggs, being unfertile, keep good indefinitely.

Sufficient pullets just commencing to lay for the space available should be purchased. A house 6 feet square will hold 15 to 20 birds comfortably, and a run not more than twice or three times the size will accommodate these, provided a good depth of litter (straw, grass, chaff, dry weeds or leaves, etc.), into which all the grain fed should be put, to induce scratching exercise, is spread over the floor of the house or enclosed on a small part of the run. All the house scraps (bits of meat, vegetables, pudding, etc.) should be saved and mixed with warm water or sour milk and then dried off with a little mealie meal to a crumbly consistency. This should be fed to the birds in a trough at 4 p.m. in the proportion of half a handful to each bird, and in the morning grain, ringing the changes on crushed mealies, munga and sunflower seed at the rate of one handful to each bird, well buried in the litter. As much chopped up green food as the birds will eat should be given twice a day. Clean fresh water as well as grit (any small hard sharp stones the size of a pea are suitable), wood charcoal of the same size and oyster shell or *well slaked* lime should always be before the birds. The pullets originally purchased should be kept till just before their second moult, when they should be sold for killing and a new lot purchased. The birds thus treated will soon pay for themselves and their housing accommodation in eggs produced. They will subsequently pay a handsome profit, over and above the cost of feeding and care, and the members of the household will have the benefit of good fresh eggs every day at a low cost. It goes without saying that scrupulous cleanliness must be observed to get the best results. The accompanying photograph shews the type of house most suitable for fowls kept in a back yard.

Poultry Keeping in the Garden.—Many are under the impression that it is impossible to combine poultry keeping and gardening. True, fowls cannot be kept in a flower garden, but they can in a vegetable garden, with benefit to both, and by the following method:—Enclose the vegetable garden or a part of it with wire netting; in the middle of this place the house, and divide the area so enclosed into four by running wire netting from each corner of the house to each corner of the fence surrounding the ground. The front of the house should be of wire netting, with a wire netting door. On each side and at the back of the house place a small trap door for egress and ingress of the fowls. Plant the whole with vegetables, the quick growing ones and those to be used first in the front section, slower growing ones and those to be used next on one side section, and similarly the back and the other side section. After all the vegetables required have been used from the front section put in the fowls; they will finish what green food is left, clean up grubs, insects, weeds and weed seeds, and manure the ground, etc., while the vegetables meanwhile on the second portion are being used, and when finished the door in front should be closed, and the trap door at the side opened to allow the birds egress into the second portion. The front section is then immediately dug over and planted again; in this way a rotation of vegetables, which grow very quickly and luxuriantly—being well manured and free from grubs and insects—is obtained, while the fowls reap the benefit of being frequently changed to fresh ground, and given access to green food, insects and grubs which they convert into eggs.

The poultry keeper who runs his fowls in the garden can also rear a few chicks (but should not overdo it) for a continued supply of layers and an occasional young cockerel for table. The young chicks can be run among the bushes or under fruit trees, to the mutual benefit of each, until they begin to do damage, when they should be enclosed in a run among the fruit trees. The poultry keeper should commence by purchasing one pen, say a cockerel and six or eight two-year-old hens, or a two-year-old cock and six or eight pullets, and when sufficient chicks are hatched, the cock or cockerel, as the case may be, can be sold. The feeding is practically the same as that given for the back yard poultry keeper, with the difference that a less quantity of food is necessary, as the birds in this case are able to obtain a fair amount of natural food in the shape of insects, grubs, green food and weed seeds. Fowls thus kept in a garden should not only supply all the eggs and poultry meat required for the house, but by the sale of surplus eggs quite an appreciable sum of money can be made.

Poultry Keeping on a small Plot.—As mentioned above, the amount of profit made out of poultry run on a plot depends upon the acreage available, for if there is sufficient to grow the green crops and grain food necessary for the birds, naturally the expense is greatly reduced. A well defined plan should be decided upon, and then gradually worked out, and each section, *i.e.*, the breeding pens, the laying pens, the chicken rearing ground, etc., kept separate. One, certainly not more than two, good breeding pens should be purchased, and every chick possible hatched from these, and run if possible on free range, among (if there are any) the fruit trees—poultry farming and fruit farming is one of the best combinations we have. If there is room for a couple of cows all the better; the thick separated milk from these is one of the best egg producers possible, and keeps the birds in good health; it is also one of the best foods for rearing chickens.

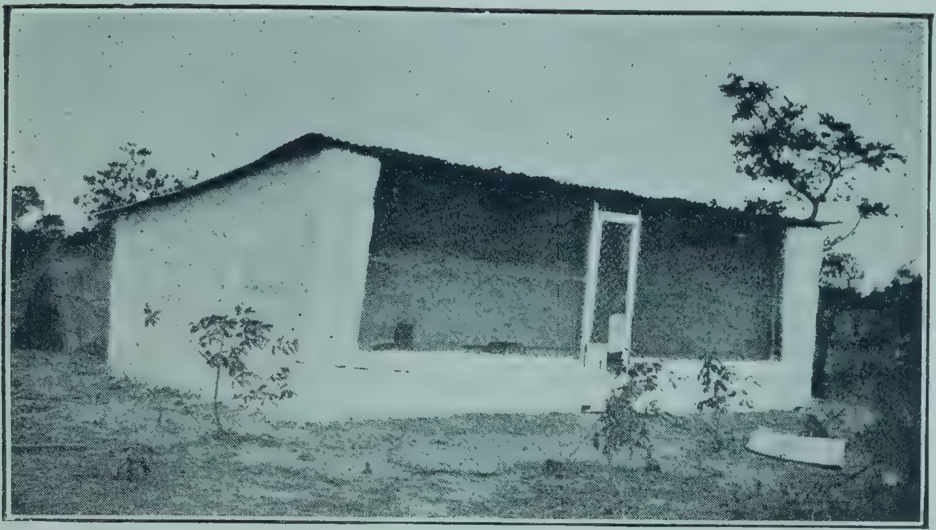
With proper management and a certain amount of ingenuity quite an appreciable quantity of foods of different kinds can be grown on a small plot, but the most paying and economical one is sunflowers. The seeds are used for grain; the head, minus the seeds, when dry, can be ground into a meal, while the leaves can be chopped up and fed green or dried, chaffed and sifted and fed either alone and scalded, or in the dry mash. The pith of the stem is an excellent food for young chicks, especially when they are growing their feathers. Those pens or runs which are not being occupied should always have a green crop growing in them.

As an instance of what can be made from poultry on a small plot, there is one of three acres outside Bulawayo on which there are running 500 layers (and these are being increased in number each year), bringing their owner a net profit each month of from £45 to £50. Commercial eggs only are sold, and the average price is 2s. 6d. per doz.

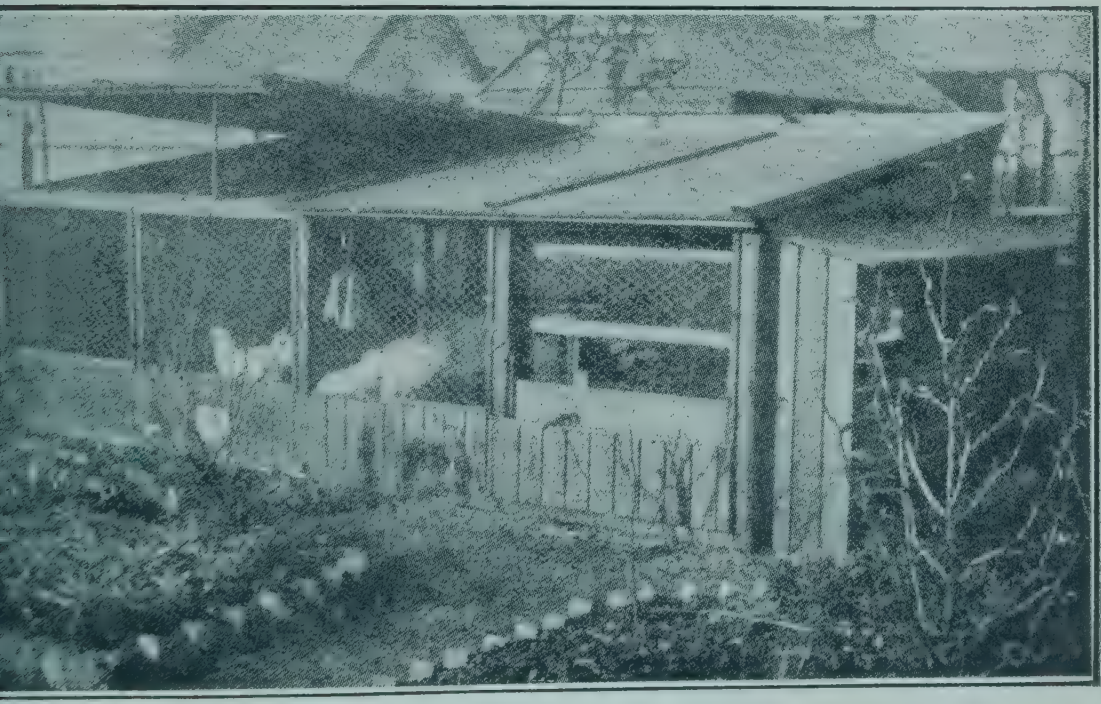
Poultry Keeping on a Farm.—This is the simplest and most profitable method of keeping poultry. On practically all farms there are some birds, either pure-bred or cross-bred. These should, shortly before the breeding season, be examined, and the best, strongest and most vigorous birds and the best layers selected. They should run apart from the other fowls, with, if there is such a bird on the farm, a good strong healthy young cockerel, with the points that are found in a breeder of good layers well defined. If there is not such a bird one should be bought, but there should be no other rooster on the place. If these breeding birds can be run apart from the other birds, *i.e.*, those kept for unfertile market eggs only, all the better, for birds running on free range produce stronger and more vigorous chicks, and the expense of keeping them on a farm is almost nil. If this is not possible, either one or other, *i.e.*, the breeding birds or the layers, must be penned up. From these breeding birds every chick possible, nearly all of which will develop into good layers and strong birds, should be hatched, and when the pullets start to lay the other birds which were originally discarded as not good enough for breeding from should be got rid of. The young cockerels, as soon as the sex is apparent, should be moved to another part of the farm, run on free range and sold for killing as soon as they are of marketable size. If the farmer intends to go in for pure-bred fowls, *one breed only* should be kept for the reasons given previously. One or two meals only daily, and that of grain, are necessary for the chicks. Needless to say, the birds should always have comfortable houses, sleep dry at night, be kept clean, and have plenty of fresh pure air night and day. More important still, they should always have access to hard sharp grit, wood charcoal, oyster shell or well slaked lime and clean water. Any grains grown on the farm, such as mealies (crushed), munga, wheat, buckwheat, kaffir corn, sunflowers, monkey nuts, etc., etc., are suitable, but when given either to adults or chickens, *must always* be thrown into thick grass or litter of any sort to induce scratching exercise, which is so essential for the well-being of the birds and the production of eggs.

Poultry Keeping by the Breeder.—The breeder is the man or woman who makes it his or her business to produce, in addition to some eggs for market purposes, those for hatching heavy layers and stock for sale, as breeders of heavy layers and healthy vigorous birds. The plant required for this purpose, *i.e.*, breeding pens, incubators, coops, trap nests, single pens, etc., is more expensive, but should be acquired gradually, and additions made as the returns from the business warrant it. A commencement should be made with not more than two breeds, and never at any time should there be more than three, one of which should be a speciality. If it is decided to go in for three, a laying breed, a dual purpose and a purely table breed should be chosen; if for two only, the first two mentioned. The ground required is not large in extent if the breeder does not intend to grow his own crops, for on a poultry farm confined principally to breeding stock, by the time the breeding season comes round again, all birds except those chosen as breeders for the coming season should have been disposed of.

Such is the basis and beginning of poultry keeping, and any man or woman who is prepared to work on these lines will make a good living.



House made of "Kimberley" brick, suitable for 100 layers on small plot.



Poultry house suitable for back yard.

Cattle on Shares.

By Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.

In connection with the practice, very general in Southern Rhodesia, of persons owning cattle and running them on shares with farmers, we have been consulted as to fair terms under which such an arrangement can be conducted. Accordingly a general draft has been prepared, *susceptible always to modification to suit particular cases,* or to such bargain as may be made between the parties interested. Circumstances alter cases, and it is realised that variations will often be called for, particularly in the case of farmers conducting dairying operations.

We would be glad to receive criticisms or suggestions or information with regard to other terms which have been found advantageous mutually in order further to improve these proposals.

The provisions of an agreement are given below, but it is of course competent to alter or adapt these to meet the views of the parties concerned. In such a model as is shewn here some complication arises from the inclusion of a greater variety of conditions and stipulations than would probably in practice be incorporated in any one individual case. This is intentional in order to suggest all terms such a contract may contain. The form of agreement may be either a legally framed document (a wise precaution) or a simple exchange of letters between the parties, who for simplicity are here termed the stock-owner and the farmer.

Cattle given out on shares are for obvious reasons usually of a hardy type, native or grade stock not likely readily to come to harm, and this is in the interest of both parties.

At first sight the following terms appear complicated, as provision has been made for every eventuality which may arise, but in practice agreements much on these lines are found to be simple and to work smoothly.

Preamble.—The agreement is in respect of certain cattle described in the schedule, the property of the stock-owner and delivered into the care of the farmer, and relates further to the progeny of the same until division takes place, and of the stock-owner's share of such increase after division.

Duration.—The agreement is from year to year from a fixed date, subject to three months' notice on either side of termination and automatically continuing unless such notice is given.

Alternatively the contract might be for, say, five years, with or without a year to year renewal thereafter.

Generally also it is understood that the arrangement is to hold good for a number of years, though as a precaution a year to year basis may be insisted upon, at least after the first period lapses. The stock-owner may not like to lock up his capital for too long, whilst the farmer lives in hope of soon having enough cattle of his own to stock his farm.

Terms for Non-breeding Stock.—Male stock over six months of age and heifers from the age of six months until date of first calving shall be kept on the same terms as breeding stock except that a charge at the rate of 15s. per annum (or 1s. 3d. per mensem) per head shall be payable to the farmer annually at the date of termination (and renewal) of the agreement, and prior to the removal of any of the stock from the farm. Payment may be made at the option of the owner in cash or in kind on the basis of the most recent annual valuation. Such stock may be removed at any time from the farm at the written request of farmer or owner, on one month's notice being given.

In this section the figure of 15s. is provisional, and subject to arrangement. It is based on 6s. per annum for grazing, 4s. for dipping, and 2s. for herding, or 12s. net per annum, and a return to the farmer for this outlay for his supervision of 25 per cent., as there is no progeny in which in this instance he can share. The veld is of no value without live stock on it, so that the first figure is a fit point for bargaining on.

One month's notice is allowed to enable the stock-owner to sell at any time he may wish, or to enable the farmer to be released in case of veld being burnt or otherwise wishing to be relieved of non-breeding animals. This section, it is to be observed, only applies to non-reproductive stock, not to the cows.

Terms for Breeding Stock.—Breeding stock, that is cows and heifers, accepted for this purpose by the farmer from the stock-owner shall be maintained and cared for by the former free of all charge to the latter, and subject to all other stipulations contained in the agreement until conclusion of the contract, or rejection of any individual animals by the farmer, to take effect at the annual renewal of the agreement, and only then.

No grazing or other charges shall be payable to the farmer in respect of stock under six months old, whether calved on the farm or brought with their dams on to the farm at the commencement of the contract. On attainment of that age charges shall be levied according to the scales provided for in this contract. Unweaned calves at foot at the commencement of the agreement shall be included in the first division of progeny, that is, they shall be counted as increase.

Division of Increase.—At the end of the first year and annually thereafter the progeny of the breeding stock shall be divided as detailed hereunder, and after such division each share shall belong exclusively to the stock-owner and the farmer respectively.

Two systems of division of the increase are possible. The first applies to division in equal shares only. The farmer divides the progeny into two mobs equably, and the stock-owner shall then choose one mob as his share. The sexes should of course be fairly divided in each mob. The second system is applicable to such other proportions of division as may be agreed upon. The farmer and the stock-owner shall toss for first pick, and then select, turn about, first all the heifer calves and then the bull calves.

The stock-owner shall brand his share, which thereafter shall be regarded as his exclusive property. If kept on the farm they shall, on attaining the age of six months, be kept at the rates and conditions specially provided for male stock, and heifers bred on the farm. The owner shall give seven days' notice of his intention to visit the farmer for the purpose of annual division of progeny, which shall take place (except by mutual consent) within one month of the anniversary, before or after.

Scope of Agreement.—The farmer shall supply grazing and all food, kraals, water, drugs, dipping, herding and care, including veterinary attention.

Losses off the Farm.—In cases of loss by straying, or of death occurring beyond the limits of the farm from any cause, the farmer shall pay in compensation to the owner the assessed value of the stock, or shall at the owner's option replace it by an animal or animals of that value. In case of injury to stock occurring off the farm, the farmer shall make same good to the owner. If from any cause any animals leave the farm, the farmer shall pay pound fees and all other expenses in recovering same.

Losses on the Farm.—The stock-owner accepts all risks of death, injury or depreciation from age, ill-health, accident or condition occurring on the farm, except so far as due to malice or negligence on the part of the farmer or his servants.

Valuation.—All animals shall be valued, either on terms mutually agreed upon, or by a valuator jointly accepted or appointed at the commencement of the agreement, and annually thereafter to provide a basis of settlement throughout the year, in case of dispute regarding compensation or any other question which may arise.

Bulls.—The farmer shall supply bulls as and when necessary of such breed or breeding as is agreed upon mutually, and of a value of not less than £ / , to be sound, in good condition, under seven years of age, and not to be used for more than fifty cows per annum. In certain instances the owner may further stipulate that the bulls used shall be subject to his approval. No bull over six months of age, other than the property of the farmer, shall be allowed to be kept on the farm, except with the written consent of both farmer and stock-owner.

Heifers.—In the event of any heifers belonging to the stock-owner calving under the age of 30 months, the farmer shall replace same by a heifer of equal value in all respects, but to calve between the ages of 36 and 42 months; this stipulation, of course, shall not apply until the stock has been with the farmer for upwards of ten months. The object of this rather involved stipulation is to prevent carelessness on the part of the farmer, as premature breeding seriously injuries both dam and offspring.

Exception to this section may be taken by the farmer owing to the well-known frequency of such occurrences, especially on unfenced farms. An honest farmer might therefore scruple before undertaking such a liability; on the other hand, reasonable precautions to prevent premature calving are quite in his own interest in respect both of the cattle referred to in the agreement and any others he may have on the farm.

The calf of the heifer in question is of course the property of the farmer on the principle that unweaned stock is counted with the dam.

Brands.—The stock-owner shall register a brand and supply branding irons, and shall be responsible that all his stock are distinctly branded when sent to the farm. The farmer shall brand free of charge cattle left on the farm after every annual division.

Castration and Dehorning.—Castration and dehorning, if jointly agreed upon, shall be performed without charge by the farmer at the sole risk of the stock-owner in respect of his cattle, and at joint risk in the case of undivided stock.

Milk.—As regards milk, various arrangements may be made materially influencing the other conditions, particularly those relating to shares of the increase and grazing charges.

(A.) No milk shall be taken from the cows, but the calves have all. (Pure ranching.)

(B.) Cows may be milked for the domestic use of the farmer only, and not for sale or any form of dairy produce. (Domestic use.)

(C.) Cows may be milked once a day, and milk or other dairy produce therefrom sold. The milk is to be measured at least once a week, and paid for at the rate of   pence per gallon, the owner, or a representative duly authorised by him in writing, to have the right at any time of checking quantity. (Moderate dairy farming.)

(D.) Cows to be milked twice a day on the terms indicated in (C.) (Dairying.)

(E.) Cows to be milked, milk to be the property of either farmer or stock-owner as may be arranged and calves to be taken by the other, or such other arrangement come to as may suit both parties. (Dairying. Endless modifications on these lines are possible, particularly in regard to feeding, quality of stock and so on, and may pass out of the purview of a simple profit sharing arrangement contemplated in these proposals.)

An agreement containing milking clauses is only likely exceptionally to be entered into, and then in cases where fairly frequent inspection by the owner is possible. The progeny in such cases is almost sure to suffer, for a dairyman's calves are notorious, therefore the owner should have an interest in the milk or cream sold. Owing to the greater labour and feeding involved, a three-fifths interest to the farmer is perhaps fair. Settlement is simplified if all dairy products disposed of are accounted for by credit slips from a butter factory or other reliable source.

In preparing these notes the writer has had the kindly assistance of a number of farmers and others with personal experience of the working of such agreements.

Stock Regulations.

The following summary of the stock regulations is published principally for the benefit of new-comers to the Territory who are not acquainted with the regulations of the Veterinary Department.

IMPORTATIONS.

Cattle.—Pedigree stock of any age may be imported into Southern Rhodesia under permit from Great Britain, Ireland, United States of America, Netherlands, Cape Province, Orange Free State and Transvaal. Such stock may be imported from Natal after undergoing a period of quarantine at Volksrust of one month as prescribed by the regulations of the Union of South Africa. Non-pedigree stock not having more than two permanent incisor teeth may be imported from the Cape Province, Orange Free State and Transvaal. All applications should be made to the Chief Veterinary Surgeon, Salisbury. Cattle from overseas are subject to the tuberculin test at Pirbright, England, when shipped with cattle for the Union, particulars of which were given in the *Rhodesia Agricultural Journal*, December, 1919. Under no conditions may cattle of any description be imported into Southern Rhodesia from Northern Rhodesia, Bechuanaland Protectorate and Portuguese East Africa.

Pigs may be imported from the Union and the Bechuanaland Protectorate subject to a veterinary certificate of health.

Sheep and Goats may be imported from the Bechuanaland Protectorate and the Union of South Africa, but not from heart-water areas. All animals must be accompanied by a certificate stating that they are free of scab.

Horses, Mules and Donkeys require no permit to enter Southern Rhodesia, but are subjected to the mallein test upon arrival.

Dogs may be imported from the Union and other areas without a permit, but are prohibited from the Bechuanaland Protectorate, Northern Rhodesia and Portuguese East Africa.

Poultry.—No prohibitions.

EXPORTATIONS.

Cattle.—Breeding stock of any age may be exported to the Union under a special permit from the Principal Veterinary Surgeon, Pretoria. Special arrangements have been made for the export of breeding stock to the Northern Transvaal from Matabeleland *via* Liebig's Drift subject to 30 days' quarantine at the Union quarantine station. Slaughter cattle may be exported under permit from the Veterinary Departments, Salisbury and Bulawayo, by rail to the quarantine sections of the abattoirs at Johannesburg and Pretoria. Slaughter stock from Matabeleland and the south east portion of Mashonaland may also travel to the same destinations by road *via* Liebig's Drift and Messina.

There are no restrictions in regard to sheep, pigs, horses, mules or donkeys. Dogs require a veterinary certificate of health.

MOVEMENTS OF STOCK WITHIN SOUTHERN RHODESIA.

Pigs and equines require no permit. Cattle and sheep can be moved under permit from a cattle inspector or an issuer of permits.

There are certain watertight compartments in regard to cattle for transportation movement within which transport is limited, excepting when the movement is a terminal one.

Slaughter and breeding stock may be moved from any district to another subject to the application being approved of by the cattle inspector or veterinary surgeon in the district whence the cattle are proceeding. The permission of the occupiers of farms *en route* has to be obtained when cattle are travelling by road.

When an outbreak of East Coast Fever occurs the infected farm or farms are immediately quarantined and a certain area around is made a quarantine area. No outward movement from either area is permitted. Cattle may be permitted to enter the infected area, or they may be moved within the guard area, but no transport from one farm to another is allowed.

When an outbreak of quarter-evil or anthrax occurs all carcases must be destroyed by burning or burial at least six feet under the ground. No movement is permitted until 14 days after inoculation have elapsed.

TICK INFESTATION.

No owner of cattle is permitted to have on his farm cattle with ten or more engorged ticks on them not being bont or bont-legged, otherwise he is liable to prosecution. Cattle have to be dipped every seven days, and the dipping fluid has to be kept up to the standard strength of .16 per cent. of arsenious oxide as prescribed by the Cattle Cleansing Ordinance, 1918.

It is not lawful for any owner of cattle to have any cattle on any road, public outspan, commonage or any property other than his own unless they are free from ticks. Any beast having ten or more ticks (not specified) shall not be considered free from ticks.

Fodder.—Fodder roots may be imported from the Cape and Orange Free State, but from the Transvaal and Natal a permit is required from the Chief Veterinary Surgeon, Salisbury. In this case a veterinary certificate has to be obtained stating that the area from which the roots have come is free from East Coast Fever.

Fodder plants may be exported to the Union under a permit from the Chief Veterinary Surgeon, Salisbury. No Rhodesian hay or bedding of any kind may be sent out of Southern Rhodesia.

1st February, 1920.

Veterinary Surgeons are stationed at the following places:—Salisbury, Bulawayo, Melsetter, Victoria, Gwelo and Umtali.

Cattle Inspectors are stationed at the following places:—Penkridge, Victoria, West Nicholson, Liebig's Drift, Enkeldoorn, Umtali, Que Que, Bindura, Umvuma, Selukwe, Hunter's Road, Bulawayo, Gwanda, Wankie, Hartley, Essexvale, Kezi, Plumtree, Beatrice, Sinoia, Gwelo, Macheke, Insiza, Marandellas, Chipinga, Salisbury, Melsetter, Mrewa, Fort Usher, Inyanga, Mazoe, Shabani, Nyamandhlovu, Belingwe, Inyati, Rusape, Gatooma.

Clerks in the Native Department at the following places are authorised to issue permits for the movement of animals:—Hartley, Mazoe, Sinoia, Marandellas, Mrewa, Rusape, Inyanga, Melsetter, Chipinga, Umvuma, Que Que, Selukwe, Belingwe, Fort Rixon, Umzingwane, Inyati, Fort Usher, Plumtree, Nyamandhlovu, Gwanda.

Members of the B.S.A. Police at the following stations are authorised to issue permits for the movement of animals:—Banket, Beatrice, Enkeldoorn, Figtree, Filabusi, Holi, Headlands, Makaha, Makwiro, Mphoengs, Sipolilo, Tuli, Wedza, Marula, Liebig's Drift.

The Postmaster, Macheke; the Magistrate's Clerk, Gatooma.

First Annual Egg-Laying Test of Rhodesia, 1920-1921.

The educational possibilities of this egg-laying test will be of great practical service in the advancement of the poultry industry. The idea is not merely the contrasting of one breeder's fowls with another, nor of one breed with others, but to give each year an additional stimulus to the industry and to promote breeding for egg production on the following lines:—

(a) Breeding from hens of proved good laying qualities.

(b) Mating only male birds that have been bred from good laying stock.

(c) Breeding only from layers of eggs of good marketable size.

(d) Breeding from as good specimens as regards standard colour, size and type as is compatible with the objects in view, viz., good laying qualities, health, vigour and stamina.

The idea is also to prove that, given effort, intelligence and care, poultry will not only pay, but pay well. In addition, the study of the birds, the conditions under which they are kept, the food given, the seasons, the climatic changes, etc., will supply numerous data for the benefit of poultry keepers and the future poultry industry of Rhodesia.

RULES.

(1) The contest shall be known as "The Annual Egg-laying Test of Rhodesia," under the supervision of the Poultry Expert of the Department of Agriculture.

(2) The contest will extend over 48 weeks, from 1st April, 1920, to 2nd March, 1921, inclusive. Each pen of birds must be delivered, carriage paid to Salisbury Station, not earlier than 12th March or later than 18th March, 1920. Empty crates will be immediately returned to owners, and must be forwarded again by them during the last week of the test.

(3) The test will be controlled by the Poultry Expert, with a consultative committee of not more than three members elected from the poultry clubs of Rhodesia.

(4) At the close of the contest birds will be returned to their respective owners, carriage forward. Pens that are not laying may be returned any time during the last week of the contest.

(5) All details, including number, weight and market value of eggs laid, quantities of foods consumed, duration of moult, frequency and periods of broodiness, etc., will be recorded.

Both weekly and monthly egg bulletins will be sent to each competitor, weekly reports on the progress of the contest will be prepared for the newspapers, and monthly reports will be sent to the Poultry Press and *Agricultural Journal.*

(6) There will be accommodation for 20 pens. Each pen shall consist of five pure-bred pullets of some well recognised breed or variety, and shall, for the first test, be the *bona fide* property of the competitor; for subsequent tests they must be bred by the owner.

(7) The Poultry Expert may at any time before the commencement of the test return or destroy any birds suffering from a contagious or infectious disease, or return any that is infested with parasites, is immature, unhealthy, or over age, insufficiently typical of the breed it represents, or otherwise unsuitable for the contest, but the competitor may replace at once any bird so returned or destroyed.

(8) In the event of a bird dying during the test, becoming diseased or developing vicious habits (such as egg eating or feather eating), it will be returned, the egg record being retained, and the competitor, upon being notified, may replace it with another of the same age and breed, but eggs from replaced birds will not be counted in the contest record till the expiration of three days after notification by wire.

(9) A *post mortem* examination will be made of any bird dying, and a copy of the report forwarded to its owner.

(10) In the event of any bird developing any permanent physical defect which interferes with its production, it will, at the option of the

owner (to be exercised within seven days after notification), be killed, and at the discretion of the Poultry Expert, a *post mortem* examination made, and a copy of the report forwarded to the owner, who will have the right of replacement.

(11) No competitor shall withdraw any bird till the termination of the contest.

(12) Pullets that do not lay during the first six months of the contest, or pullets that persist in laying under 1½ oz. eggs or soft-shelled eggs, will be declared incompatible with the purposes of the contest and be disqualified.

(13) All eggs shall become the property of the Department of Agriculture.

(14) Awards will be allotted according to the total weight of marketable eggs; eggs weighing less than ¾ oz. for the first 10 weeks and less than 2 oz. after this period will be considered unmarketable and not be counted for purposes of awards, but will be recorded.

(15) Any pen the eggs from which do not attain an average weight of 24 oz. per dozen before the expiration of the first four months of the contest will be ineligible for an award prize for that year.

(16) A winter test will extend over the first four months of the contest.

(17) An entry fee of £2 2s. is required for each pen, 10s. of which must accompany the competitor's application, the balance to be paid on or before 1st March. Failure to make second payment will automatically forfeit the first. Competitors who wish their birds trap-nested will be required to pay an additional fee of £1 10s.

(18) Awards in the form of certificates will be granted as follows, in accordance with rule 14:—

(a) First, second and third for the three best pens for the duration of the contest.

(b) One in each variety for the duration of the contest, provided three or more pens are competing in such variety.

(c) First, second and third for the three best pens for the duration of the winter test.

(d) A special award will be given—

(1) to the pen laying the greatest number of 2 oz. and over eggs;

(2) to the trap-nested hen laying the greatest weight of eggs;

(3) to the trap-nested hen laying the greatest number of 2 oz. and over eggs;

(4) to the pen laying the greatest weight without replacement of a bird.

(e) Any pen laying an aggregate number of 950 eggs or more, or any trap-nested hen laying 200 eggs, will receive a "special merit" ribbon. Any pen laying an aggregate number of 1,100 eggs or more and any trap-nested hen laying 250 eggs or more will receive a "superb performance" ribbon.

(19) A competitor may not enter more than one pen of a variety.

(20) In the event of entries exceeding the number of pens available, applicants who have entered more than one pen will be limited to one, and will be given the choice as to which they desire to compete with. In the event of entries being then too numerous, the acceptance of these (after Rhodesian breeders have been given the preference) will be determined by ballot.

(21) After the birds have been received by the Department of Agriculture and placed in their pens every reasonable care will be taken for their protection and prevention of loss, but the Department will not be held responsible should death or losses occur.

(22) The contest will be open to breeders of pure-bred poultry residing in South Africa, preference being given to Rhodesian breeders.

(23) Competitors and others interested are not permitted to communicate with any of the officials concerned or connected with the contest, except the Director of Agriculture and the Poultry Expert, nor shall they be allowed access to the site of the contest during its currency without a written consent of one of the above officials.

(24) In the event of any dispute arising on any point connected with the contest, the decision of the Director of Agriculture shall be final.

(25) In the event of circumstances arising which render it expedient to close the contest, the Department of Agriculture reserves the right to return the birds to their owners.

(26) Any competitor contravening any of the above rules will be liable to disqualification.

INFORMATION AND SUGGESTIONS.

(a) All entries must be made on the entry form, which, together with the declaration, must be fully signed by the competitor, and with the first instalment of the entry fee be received not later than 14th February, 1920, by the Poultry Expert, Department of Agriculture, to whom all correspondence relating to the contest must be addressed.

(b) The Department of Agriculture will supply numbered leg bands for all entries, and will send these to the owner in advance in order that his birds may be positively identified on and after their arrival at the site of the contest. After the birds have been placed in the competing pen they will be marked with permanent sealed bands with numbers that correspond to those put on by the owner.

(c) As soon as possible after 1st March those competitors entitled to compete will be sent an addressed label with the pen number thereon for attaching to the crate or hamper in which their birds will be sent to the contest.

(d) Competitors are required to exercise the greatest possible care with respect to the health of the birds sent to the contest; it is suggested that such birds be isolated at least 10 days before the date of their despatch. Competitors are warned that the closest scrutiny will be exercised over the health of the birds on their arrival, and any bird not in sound health will be returned at once. To avoid risk of infection all birds should be sent in suitable crates or hampers which have not previously been used for conveying poultry.

(e) It is suggested that competitors do not send pullets that are too mature, as there is a risk of such birds going into a moult, which results in a lower egg yield; on the other hand, competitors are strongly advised not to send very immature birds, for these do not commence to lay for some weeks after the contest opens. See rule (6).

The best birds are those that would naturally begin laying a week or two before the contest opens, but are prevented from doing so by being moved. Such birds come into lay during the first or second week of the contest. Size and weight of the birds too is a guide, and the following minimum weights are suggested for pullets of the undermentioned breeds at the time of their despatch to the contest:—

White Leghorn, 3 lbs.;
Black Leghorn, 3 lbs.;
Minorca, 3½ lbs.;
White Wyandotte, 4½ lbs.;
Rhode Island Reds, 4¾ lbs.;
Rocks, 4¾ lbs.;
Orpington, 4¾ lbs.

(f) Competitors are requested to co-operate with the Poultry Expert by furnishing data regarding the early care and management of their competing pens, methods of hatching, system of brooding and other information which will help to make a bulletin on the contest of more value. Forms will be furnished for this purpose.

Further awards will be offered, notification of which will be issued during the period of the test.

The Austin Tractor.

By A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.,
Agricultural Engineer.

Following upon the demonstrations by the Fordson tractor, details of which were given in the *Rhodesia Agricultural Journal* of August, 1919, a further series has recently been given, this time by the Austin tractor, a product of the Austin Motor Co., Ltd.

This tractor is British made throughout and gives evidence of skill and careful workmanship both in its design and construction.

The framework is constituted of the engine, transmission and back axle casings, forming a hollow frame structure of great strength. All working parts are enclosed and thoroughly dust and wet proof. The engine has four cylinders cast *en bloc* with detachable head, the crankshaft being supported on five bearings. At a speed of 1,200 revolutions per minute the engine, when running on paraffin, develops 25 horse-power (English standard). A small quantity of petrol is used for starting, and when heated up the engine runs on ordinary paraffin. The fuel is gravity fed, the vaporiser being heated by the exhaust gases. Ignition is by high tension magneto. Cooling is by means of the thermo syphon system, the radiator being carried at the front of the engine and cooled by a gear driven fan. The wheel base is 5 feet 8 inches, with track centres, 4 feet rear wheels and 4 feet 3 inches front wheels. The overall width is 5 feet 1 inch, and the tractor can be turned in a circle of 22 feet. The forward speeds are 2½ and 4½ miles per hour and reverse 2 miles per hour. The makers claim a draw bar pull of 3,000 pounds on low gear, which they state is ample for pulling three furrows 10 inches wide and 6 inches deep. For stationary work a belt pulley can be fitted capable of operating a 54 inch threshing machine or other farm machinery. The back wheels are fitted with spuds, which are detached and replaced by rubber pads when the tractor is used for road haulage work.

Trials were carried out in December at the municipal farm, Hartmann Hill, on heavy red soil which at the time was hard and dry. Several different types of ploughs, including a two-furrow mouldboard and three and four furrow discs, were used. Although the depth ploughed was not so great with the latter as with the two and three furrow implements, yet the tractor proved its capability of hauling either type with comparative ease. The speed maintained was good, and the ploughing well done. In a further demonstration the flexibility and safety of this tractor in negotiating rough ground and rapidity of turning were well proved.

Further trials were made by the same tractor at Mr. R. Garvin's farm Virginia, and on the B.S.A. Company's Citrus Estate, Mazoe. In both cases it is understood those present expressed satisfaction with the good work done.

It is to be regretted that the agents for the various tractors so far introduced into this country have not given facilities for competitive trials, to enable a comparison to be made between the types in regard to reliability, fuel and oil consumption, etc. While the time may not yet have come for the general use of tractors in this country, there is little doubt that a favourable impression as to their utility has been created. It is possible that the greatest scope for tractors will be found on farms where the area of grazing in proportion to the arable land is small, and where facilities do not exist for running large numbers of oxen.

Austin tractor at work on municipal land, Salisbury,

Austin tractor trial at Salisbury.

Agricultural Experiments, 1919-20.

We publish below a list of some of the more important investigations in progress at the Government experiment station, Salisbury, during the current season. Farmers and others interested in these experiments are cordially invited to inspect the plots. The Department of Agriculture should, however, first be notified, when arrangements will be made to shew visitors over the station.

MAIZE.

(a) Variety trials—Potchefstroom Pearl and others.

(b) Row tests with different strains of Salisbury White.

(c) Cultural trials to test effect of ridging *versus* flat cultivation.

(d) Rotation experiments: (1) maize continuous, (2) alternate maize and bare fallow, (3) maize in a three-course rotation without manure, (4) in a four-course rotation with kraal manure, (5) three years maize (one year dunged) and a fine straw crop, (6) three years maize (one year artificials) and velvet bean ploughed under, (7) maize in rotation with sunflower.

(e) Mixed crops of maize and various legumes for silage.

(f) Dates of planting and ploughing trials.

(g) Breeding plot of Salisbury White.

(h) Effect of fertility of soil on row numbers of Salisbury White.

MAIZE MANURIAL TRIALS.

(a) Comparison of velvet bean as a green manure crop.

(b) Velvet bean plus lime for green manuring.

(c) Lime alone.

(d) Standard complete fertiliser.

(e) Bat guano and wood ash.

(f) Green manuring with a legume *versus* a non-legume.

(g) Relative amount of plant food supplied to the soil by green manuring with velvet bean, kaffir bean, Tonga bean, ground nut, sunn hemp and Niger oil.

(h) Relative effect on succeeding maize crop of turning under entire leguminous crop as against turning under roots only—a crop of bean hay having first been taken.

LIMING TRIALS.

(a) Effect on various crops of direct applications of lime.

VARIETY TRIALS.

(a) Beans (80); (b) ground nuts; (c) linseed; (d) wheats (summer); (e) oats (summer); (f) millets; (g) kaffir corns; (h) root crops; (i) buckwheat.

FIBRE CROPS.

(a) Cotton; (b) flax; (c) sunn hemp; (d) deccan hemp (*Hibiscus cannabinus*); (e) sisal hemp; (f) Mauritius hemp; (g) ramie; (h) vofa nettle.

HAY CROPS.

(a) Teff; (b) manna; (c) Sudan grass; (d) Sudan and teff; (e) Sudan and oats; (f) Sudan, teff and oats; (g) Sudan, teff, oats and peas; (h) molasses grass.

PASTURE PLANTS AND GRASSES.

(a) Kikuyu alone and in mixtures; (b) lucerne varieties; (c) Guinea grass; (d) various native grasses; (e) side oat grass, Australian blue grass, Mitchell grass, *Chloris* sp.; (f) Kudzu vine.

COARSE FODDER PLANTS FOR SOILING OR GRAZING.

(a) Napier fodder; (b) Indian cane; (c) Uba cane; (d) cow cane; (e) sweet clover; (f) dhal; (g) beggar weed.

Bog Earth.

Report by the Government Agricultural Chemist, Salisbury, on the analysis of an air-dried sample of "Bog Earth"—Lab. No. 210G—submitted by Mr. T. H. Davison, Mtao Halt, P.O. Umvuma.

Analysis :—

Water and organic matter*	62.67
Mineral matter (chiefly sand and refractory silicates)	37.33
	100.00

*Containing nitrogen 1.59 per cent.

The nitrogen exists in the bog earth in forms that are insoluble in water and comparatively inert when considered as a source of plant food; the conversion of the nitrogen into plant food can, however, be hastened by neutralising the natural acidity of the bog earth by composting it with an alkali such as wood ashes or lime.

The application of the raw bog earth to cultivated soil would be apt to do harm, because of the acidity or sourness of the earth. This acidity would be corrected by composting the earth with wood ashes or lime. It is a matter of common observation that some kinds of bog earth when thrown in great heaps may lie inert and "cold" and "sour" for years—as witnessed by the fact that nothing but a sparse vegetation of starveling weeds will be found growing upon the heaps—although the bog earth may become a highly fertile soil when the sourness has been rectified.

Unless lime can be obtained at a lower price than that commonly quoted on the local market, I am afraid that the cost of preparing a lime compost would be somewhat prohibitive, but wood ashes may be procurable at little or no cost from one of the local mines.

An empirical formula for preparing a bog earth-wood ashes compost is as follows:—5 parts by bulk of bog earth to 1 part by bulk of wood ashes. The bog earth and wood ashes are mixed as thoroughly as may be by spreading them in alternate layers and the whole is built up into a compact heap about 4 ft. high. In case the bog earth is not already moist, the finished heap should be drenched with water and then be covered with a few inches of loose bog earth and left to itself. After two or three months the heap should be shovelled over so as to thoroughly mix the ingredients; if necessary it should be again drenched with water and again covered with a loose layer of bog earth and left for another three months or so. Before the compost is applied to cultivated land, the bog earth should have undergone thorough decomposition, and whether it will be necessary to turn over the heap and drench with water more than once must be determined by observation. The time taken to thoroughly ripen the compost heap may vary from a few months to two years.

The rate of application of the ripened compost to cultivated land I would put down at about 15 Scotch cart loads per acre.

From the particulars supplied with the sample, it is concluded that there will be a considerable quantity of bog earth available, more than can be composted at once, consequently it is advised that a trial lot should be prepared on the above lines, and, after the value of the preparation for manurial purposes has been ascertained, further quantities of the reserve of bog earth can be composted as required if the improved crop returns obtained from its application to cultivated land are encouraging. The composition of the sample submitted unquestionably warrants the experimental preparation of a compost with the earth, and I am sanguine that the results obtained from its use will be very satisfactory, but I do not advise the preparation of such a compost on a large scale until its value has been definitely proved by field trial.

Agricultural Statistics of Northern Rhodesia.

SOME NOTES AND COMPARISONS.

By F. Eyles, F.L.S., Statistician.

The Administration of Northern Rhodesia in Government Notice No. 6 of 1919 published a statistical statement of crops and cattle. The count of live stock was taken on 15th March, 1919, and the crop return is an estimate made on the same date. The forms used for collecting returns are practically identical with those used in Southern Rhodesia. It would not be fair to make a general comparison between the farming figures of two countries at such different stages of development, but a few notes on points properly comparable will be of interest.

The total land under cultivation for 1918-1919 is given as 30,343 acres, or 13.2 per cent. of the cultivated land in Southern Rhodesia in 1918. Of this total, 81 per cent. is under maize, or practically the same proportion of the whole as in this Territory, which was 83.6 per cent. in 1918. The average acre-yield of maize for the last four years is given as 3.19 bags, that for Southern Rhodesia being 4.26.

Winter wheat in the North holds a position relatively much more important than in the South. The total given is actually greater than here, being 3,882 acres, compared with our 3,755 acres, while the difference in proportion is very striking, being 12.8 per cent. of total cultivated land, as against only 1.6 per cent. in Southern Rhodesia.

The total cattle in Northern Rhodesia in March last was 45,729 head, equal to 7.6 per cent. of Southern Rhodesian total. It is presumed this includes only European-owned stock, though that is not explicitly stated. The rate of increase for the year is given as 15.23 per cent., while the average for Southern Rhodesia for European cattle over the past four years has been 15 per cent. In Southern Rhodesia the number of trained oxen divided into the total of acres ploughed gives 3.3 acres per ox, while in Northern Rhodesia the figure is 3.5 acres per ox. This includes, of course, oxen used on work other than strict farming, such as transport and wood riding. The small proportion of untrained oxen in relation to those trained marks the earlier stages of a country so far as ranching is concerned. In Southern Rhodesia the untrained oxen are as 155 to 100 trained, while in Northern Rhodesia the position is reversed, the untrained being only 72 to 100.

The figures for sheep, pigs and other small stock in Northern Rhodesia are as yet too small for purposes of useful comparison.

Departmental Correspondence.

Under this heading we publish correspondence between farmers and the technical officers attached to the Department of Agriculture, containing information which may be of interest and assistance to our readers.

NATIVE GRASSES.

In reply to a query from Mr. C. S. Jobling, Bulawayo, who suggested "that attention should be paid to improving our *natural* pasturage as opposed to the introduction of foreign grasses or plants," Mr. Walters, the Assistant Agriculturist, replied as follows:—

"There are undoubtedly a great many of our native grasses and pasture plants that are of great value as fodder, although what is known as *sour veld* predominates in this country. Unfortunately most of these *sweet* grasses are either annuals or short-lived. Those that are perennial are relatively few. Veld fires tend to destroy annuals by killing both plants and seeds, but do not seriously affect the perennials. Our perennials that are sweet are such as Guinea grass (*Panicum maximum*), Napier fodder, Rhodes grass (*Chloris gayana*), Kweek grass (*Cynodon dactylon*) and Molasses grass (*Melinis minutiflora*). Kikuyu grass (*Pennisetum longistylum*) also is indigenous to Central Africa. As examples of short-lived sweet grasses may be mentioned Rhodesian fox tail (*Setaria nigrirostris*), Rhodesian paspalum (*Panicum brizanthum*), Sweet grass (*Chloris virgata*) and Wild Rapoko grass (*Elensine indica*). One of our constant aims, therefore, in our attempts at veld improvement should be to replace burning by grazing or mowing in order to enable our annual grasses to recover their rightful place in our pastures. The perennials again may be planted out successfully, or seed may even be sown in old maize lands or any land discarded to crops. It would without doubt pay well to prepare lands by ploughing for certain of them. Kikuyu grass has given such good results in the Union—even on sandstone soils—that there is every reason to believe that it will do well on most of our soils. Teff grass is not of much value as a constituent of pasture. Good pasture is of course not obtained without much trouble; much of the Kikuyu grass planted out in this country is left unprotected, and already complaints are heard that it is not so marvellous as had been expected. It is not realised that good permanent pasture is the achievement of years of labour, and if well looked after, kept free of veld fires, and not overstocked, it will go on improving almost indefinitely.

"Few or none of the excellent pasture grasses of other countries have done well in Rhodesia. *Paspalum dilatatum* is almost the only exception."

The Agricultural Outlook.

The season so far has been a complex one, and while it can in the main be regarded as favourable, there have been adverse factors. The rains in most parts of the Territory commenced early, and the record is well up to the average, but there have been intermittent dry spells which have caused anxiety. The maize crop generally is doing well as a result of timely rains towards the middle of January, and reports indicate an average yield. The Mazoe Valley in particular has had long periods without rain, and in consequence crops have suffered. The rains in most parts of Matabeleland set in late, and in places the ground in January was too hard to plough. Good rains have fallen subsequently, but it is doubtful whether the rainfall in the western area of the province is up to the average. The tobacco crop, with the exception of that in the Mazoe Valley, is doing particularly well, and it is estimated that the yield will be at least double that of last year. Frequent dry spells rendered re-planting necessary, and we hear of instances where the tobacco had to be planted five and six times. In view of the greatly increased acreage under tobacco this year it will be necessary for growers to grade leaf at the farm, and we commend to the attention of tobacco growers the article on the subject Mr. Taylor has written for this *Journal*. Cotton seed for experimental plantings was distributed to 91 growers this season, and reports state that the bushes have made excellent growth, succeeding in certain instances where the maize has succumbed to drought.

Cattle are in prime condition and reflect the luxuriance of the pasturage. The export of slaughter stock to the Union is a valuable source of income to cattle owners, and for ten months of last year represented a sum of £162,628. The canning factory at Odzi is now receiving ample supplies of suitable cattle, and regular shipments are leaving for Europe. There is a considerable local demand for canned tongues and bye-products such as fertiliser, and difficulty is being experienced in meeting it. The results of the large importations of pedigree cattle in recent years are being reflected in the herds throughout the Territory, and the progress made is most promising. In regard to disease, the position is much the same. Two fresh outbreaks of East Coast Fever are reported from the Melsetter and Penhalonga districts on farms which had been previously infected. The disease at Hunter's Road and Wolf's Hill is well in hand and cases are decreasing. Quarter-evil is still prevalent, but the mortality is not great. The outbreak of anthrax in the Shamva district spread to neighbouring farms, and a number of deaths have occurred. All the infected herds have been vaccinated and the mortality has ceased. The restrictions imposed by the Union Government in connection with the outbreak of rabies have been withdrawn, and dogs may now be exported from Rhodesia under the usual veterinary certificate.

Review.

ELEMENTARY LESSONS IN SYSTEMATIC BOTANY.

(Maskew Miller, Capetown. 2s.)

This little book, written by Harriet M. L. Bolus, is intended to encourage children to take an intelligent interest in the common plants around them and to teach them to write a correct botanical description, thus in time enabling them to make use of such standard botanical works as the "Flora Capensis," the "Flora of South Africa," and the "Flora of Tropical Africa."

Twenty South African plants, representative of well known genera, have been selected, and each is worked up into the subject of a lesson, the information and instruction afforded being progressive, so that by the time the student has reached the last lesson he or she should be reasonably familiar with the species described, with the genera represented and the technical nomenclature employed in botanical descriptions.

The illustrations by Miss Page, of the Bolus Herbarium, are clear and attractive, and well exemplify the letterpress, which is written in a simple and easily understood form.

This work should meet a much-felt want, and when studied in conjunction with the "School Garden," as it should be, will prove of inestimable help to teachers and students of botany. It will also be most helpful to many who, though not students or teachers, are nevertheless interested in the wealth of flowering plants with which we are surrounded.

Farming Calendar.

February.

BEE-KEEPING.

In some districts a second flow of honey may be looked for from the veld flowers and late growing crops. Honey being secured in either sections or shallow frames should not be permitted to remain too long on the hive at this time of year, as it will become soiled with the bees' feet. Robbers may be anticipated, and this is a sign that the honey flow is nearly over. Where stocks are short of food, feed rapidly inside the hive; excellent feeders can be supplied by appliance dealers. Queenless stocks can now be re-queened, or two stocks can readily be united by previously dusting each lot with household flour. Grade and dispose of honey. It may be advantageous to reserve the choicest specimens for exhibition and competition at our forthcoming agricultural shows.

CITRUS FRUITS.

The notes on planting still apply, if trees are still planted this month, an operation which, however, it is not desirable to leave so late. Trees planted after about the end of January may only get established when it is too late that season for them to commence growth, the consequence being that what growth there is is still sappy at the approach of the cold weather and so stands a chance of being nipped. In such case the tree would have been better left in the nursery row to be lifted and transplanted into the orchard the following spring.

By the end of February or early March the cover crop should be ready to plough into the orchard, with the possibility of sufficient rains after it is done to assist in rotting the plants in the soil. A continuous watch should be kept for insect pests, and fumigation or spraying undertaken immediately any pest is observed. If no cover crop has been sown, the orchard should be kept in a good state of cultivation, and not allowed to be overrun with grass and weeds. Destroy all fruit infested with citrus codling moth by burning or burying deeply. Do not allow the fruit to fall to the ground before destroying it, but pick all affected fruit as soon as it is observed. Considerable damage is done in some orchards by citrus codling moth, which can be controlled to some extent by using a poisoned bait made up as follows:

Arsenate of lead (paste), 2 lbs. or 3 ozs.
Arsenate of lead (powder), 1 lb. or 1½ ozs.
Treacle, 4 galls. or ½ gall.
Or sugar (cheapest), 40 lbs. or 4 lbs.
Water, 40 galls. or 4 galls.

Apply lightly in a coarse spray, getting a few large drops here and there throughout trees. Apply from beginning of the year until about early April every fortnight, and more frequently if rains wash off bait.

CROPS.

During this month the farmer's energies will be concentrated on keeping the lands thoroughly clean, and if this is done effectively now, no further serious damage from weeds need be feared. A special campaign should be waged against such weeds as Mexican marigold in the old lands, in headlands and on ant-heaps. Most summer crops will be in the ground. Maize for ensilage may still be sown, also catch crops of buckwheat and teff. The main maize crop should be cleared of suckers, which can be fed to stock. The most vigorous plants should be marked for seed selection by cutting the stalk above the cob, and the date of tasselling should be noted both in the main crop and the ensilage crop. In case of excessive moisture, the use of the wing shovel plough may be necessary. Monkey nuts should not be cultivated after the period of flowering, which is usually early in February. Hay-making should start in February if weather conditions allow. The sooner the veld is cut for hay the better the product obtained. Land for winter crops of oats and wheat should now be got ready as weather conditions permit. Napier's fodder slips planted early in the season can be divided. Potatoes are sometimes planted this month in order to obtain seed for the early plantings the following season.

DECIDUOUS FRUITS.

This is the time to carry out summer pruning, after harvesting the crop, and when the flow of sap begins to become sluggish.

ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down (see March). Certain caterpillars are sometimes troublesome. See "Some Insect Pests of Maize," *Agricultural Journal*, June, 1912, "Some Injurious Caterpillars," *Agricultural Journal*, February, 1915, and "The Maize Stalk Borer," *Agricultural Journal*, December, 1917.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. See *Agricultural Journal*, December, 1919, and February, 1920.

Potato.—Ladybirds and tuber moth may call for attention; the latter, when very bad, sometimes causes considerable wilting of the crop besides attacking the tubers. See *Agricultural Journal*, October, 1913, and February, 1910.

Cabbage Family.—All members of the family are liable to the attack of sawfly and webworm during February. See *Agricultural Journal*, February, 1914; April, 1910; and April, 1911. The sawfly may be effectively controlled by dusting during a dry spell with Paris green and slaked lime. See *Agricultural Journal*, 1918.

Beans and Cowpeas.—These suffer chiefly from stem maggot and blister beetles, which destroy the blossoms. The latter must be collected by hand. The former is dealt with in the number of this *Journal* for April, 1913.

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. At present no remedy is known except collecting and destroying the infested fruit early in the season. Aphis on the leaves and shoots may be destroyed by careful spraying with tobacco and soap wash or paraffin emulsion.

Mangolds and Beets.—These are frequently defoliated by caterpillars. Spray with an arsenical wash.

Citrus Trees.—The chief pest requiring attention during February is citrus codling. The infested fruit should be gathered and destroyed regularly. The fruit is also apt to be attacked by large fruit-piercing moths, for which unfortunately no remedy is known. For these and other pests see *Agricultural Journal*, February, 1916.

Deciduous Trees.—Apple, pear and late peaches suffer chiefly from fruit moths which puncture the fruit. No remedy is known except netting the trees.

Fig.—The fruit is liable to the attack of fig weevil. Infested fruit and all wild figs near the trees should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon disulphide into the burrow and sealing it up.

Castor Oil.—Two-year-old plants which contain borer should be cut down and burnt. See *Agricultural Journal*, October, 1912.

Mosquitoes, House Flies, Stable Flies.—Destroy all breeding places round the homestead. Poison or trap adults. See *Agricultural Journal*, June, 1915, and December, 1916.

FLOWER GARDEN.

During this month the flower garden is gradually approaching perfection, and nearly all plants are in bloom. If these are constantly plucked the yield will be increased, and except where required for seed, all flowers should be removed as they fade, for seeding shortens the life of many plants. All runners and creepers should have constant attention, and be tied up and trained. Dahlias in more exposed positions should be carefully tied to their stakes, as they now become top heavy with the weight of their blooms. Palms in the house and conservatory will benefit much if occasionally put out in the rain. Winter flowering sweet peas, if not already planted, should be sown as early as possible.

FORESTRY.

Complete planting out of ever-greens. Sow in nursery seeds of slow growing species such as cypress, pines, etc. All planting should be completed this month, in the early part if possible.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

The adult birds are coming through their moult; the sooner it is over, the sooner will they commence to lay again, although some are laying through the moult, and these are always the strongest birds and best layers, and which naturally will produce the strongest and best stock. Such birds should be marked as breeders during the coming season, and they and all others that are moulting given food to help them through it quickly, *e.g.*, sunflower seeds and pith of the stalk, also the green leaves chopped up, linseed, crushed monkey nuts, and cabbage leaves cut up, or any of the *Brassica* tribe.

Any birds that are broody from now on to the end of June are valuable to hatch the eggs which will produce the early chicks that will commence to lay next autumn when the adults go into moult. It is the chick that is hatched any time between the beginning of April and the end of August that is the most valuable, and is going to fill the egg basket at what are usually the scarce periods for eggs, and when the price is highest. A chick hatched after the middle of September is no good, of poor vitality, and a poor layer of eggs only when they are plentiful. The fact that most of the chicks were formerly hatched too late in this country accounts for the scarcity of eggs at certain periods. Watch the birds, and pick out those that are most active, most vigorous and healthy, and which shew the points as given in the article on the selection of layers in the December issue of this *Journal*, and hatch only the eggs from these.

All old hens and surplus cockerels—those not required for breeding or selling for breeding—should by now have been killed or sold for killing. At the risk of labouring the point, and it is necessary to do so, judging from the general laxity shewn, attention must be again drawn to the absolute necessity of always having before the birds, in small boxes, grit (any hard sharp stone of about the size of a pea), wood charcoal of the same size, and either oyster shell or *well slaked* lime. These are most important; without them the birds will not only not lay, but their health will be affected adversely. The same applies to scratching exercise; they *must* have this to give a good supply of eggs and keep well; they must not for the same reason have any superfluous fat on them.

Keep the birds as dry as possible to produce the maximum number of eggs. A fowl that sets wet, especially if she goes to roost in this condition, will not lay the following day, and may not do so for three days afterwards; in fact a bird that gets wet will lay on the average one egg to every three she would do if she had been kept dry.

STOCK.

Cattle.—Grass will now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little crushed and soaked mealies, or something similar, may still be given at milking, if only to bring them quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd. Weather permitting, no opportunity should be lost of getting in a supply of good sweet hay before the grass is too old.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose and move to fresh grazing and kraals.

TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping and suckering should be given attention. Selected seed plants should be given careful attention. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

VEGETABLE GARDEN.

Potatoes should receive attention and be carefully ridged up, and care taken that the stalks are not buried. Seeds for winter crops should be sown, such as beet, Brussels sprouts, cabbage, carrots, beans, peas, onions, turnips, tomatoes, etc. Vegetables planted out during this month might be placed a little closer together than usual, as watering may have to be resorted to before they mature.

WEATHER.

This is generally the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

March.

BEE-KEEPING.

Be on the look-out for damage to stocks by the wax moth; strong stocks generally tend to obviate this pest. Where the heavy rains have penetrated the weak hive roofs and caused dampness among the quilts, these should be taken off and thoroughly dried in the sun, then replace. Contract the entrances of hives to prevent robbing. Unsold honey should be stored in a warm dry cupboard. Keep apiary clear of weeds.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

CROPS.

For general cultural treatment, see February notes. Rape and kale for autumn feeding may be sown during the latter half of this month. Haymaking will continue. Land for winter crops of oats and wheat should now be ready. The division of Napier's fodder slips can be continued up to the end of this month. Buckwheat, linseed, teff grass and manna will be ready for reaping this month. The silo pit should now be got ready. Maize will be ready for ensilage in four to five weeks after the period of tasselling.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood will be found freely in the stalks, but nothing can be done at this stage. Caterpillars may attack the crop during this month, usually *as a sequence to cultivation after the weeds have been allowed to get too far ahead.* The caterpillars attack the crops on account of their food being suddenly destroyed. See "Some Insect Pests of Maize," *Agricultural Journal*, June, 1912; "Some Injurious Caterpillars," *Agricultural Journal*, February, 1915; and "The Maize Stalk Borer," *Agricultural Journal*, December, 1917.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but any plants still infested with stem borer should be removed and burned. Leaf miner will still be in evidence, and budworms may put in an appearance. See *Agricultural Journal*, December, 1919, and February, 1920.

Potato.—Ladybirds may still be injurious. See *Agricultural Journal*, October, 1913. Careful hilling should be attended to on account of the tuber moth. See *Agricultural Journal*, February, 1910.

Cabbage Family.—Sawfly. See *Agricultural Journal*, June, 1918. The fly will probably be less injurious by this time. Cabbage louse may be on the increase. Very thorough spraying with tobacco wash and soap is of value when the plants are young.

Beans and Cowpeas.—The most obvious enemies are the blister beetles, which destroy the blossoms. These can only be destroyed by hand. Stem maggot continues injurious, causing dropping of leaves on the larger plants, but little can be done at this stage.

Melon Family.—Plants of this family are subject to the attack of melon fly and aphis. Careful spraying with tobacco wash or paraffin emulsion is of value against the latter.

Sweet Potato.—Hawk moth caterpillars occasionally appear in countless thousands and defoliate the crop. Immediate spraying with an arsenical wash is called for when the insects first appear. See *Agricultural Journal*, June, 1912.

Citrus Trees.—Attention should constantly be given to the systematic collection and destruction of infested fruit to keep down the citrus codling. Large fruit-piercing moths may attack the fruit during the month (see under February).

Deciduous Trees.—But little damage from insects is likely to occur to these fruits during March.

Fig.—Fig weevil still calls for attention in collecting and destroying the infested fruit.

Castor Oil.—See under February.

Mosquitoes, etc.—See under previous month.

FLOWER GARDEN.

During this month the garden should be seen at its perfection, and, owing to our rains, requires a great deal of attention in order to keep the soil free from weeds and caking. Drainage should also be looked to, in order to avoid plants being swamped or washed away. Dahlias and carnations should now be in their heaviest bloom, and will require tying up, and the dying blooms should be removed, in order to prolong their flowering period. Plants for winter flowering should now be coming on and planted out. Cuttings of carnations may now be made, and should be picked from the choicest plants, and taken from stems which have borne the finest blooms. The cuttings should be placed in boxes containing sand, and kept in a moist condition in a warm position sheltered from the winds. These should be ready for planting out in about two months, and bloom in three. Carnations, verbena, antirrhinum, penstemon, pansy, dianthus, phlox, calliopsis and escholtzia may be sown for early blooming next spring.

FORESTRY.

If necessary, cultivate between the rows of trees planted out in the previous months. Plough any fire lines that are necessary and break up any new ground that will be required for next season's planting. Remember that the roots of trees penetrate deeply into the ground, and therefore plough as deeply as possible. Where black wattle thrives, sow seed this month, after well soaking.

GENERAL.

At this time the condition of stock on the veld is good—perhaps at their best. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

Any fowl that goes broody, even if the eggs are not ready for her, should be given a comfortable nest in a quiet place, and three or four china eggs. When the eggs to be hatched are available, slip them gently under the hen after dusk and take away the china ones; again, when the chicks are hatched, are dry, and before they begin to get restless, take them away (also after dusk) and bring them up as incubator ones are raised, and at the same time slip another setting of eggs or china ones under the hen. By this method a broody hen will bring out, if well looked after and kept free from insects, three lots of chicks. Broody hens now and for the next three or four months are most valuable, and should be treated purely as incubators. The birds chosen for breeding, *i.e.*, the strongest, healthiest, most active, vigorous, and the best layers, should now be with the male bird and producing eggs for hatching, and continue with him till the middle of August. If they are running on free-range, up to 40 or 50 can be run with one strong vigorous rooster and practically all the eggs be fertile: but the smaller the run, less birds can be given to him, and good fertility and strong chicks will be the result. Of course these birds should be quite apart from those not good enough for breeding from and which are being used only for unfertile market eggs.

All the birds should sleep dry (as well as being kept dry in the day time) and out of draughts, but in good sweet fresh air.

Refer to the *Journal* for August, 1919, or send to the Editor for Bulletin No. 330 for advice on incubation; similarly to *Journal* for October, 1919, or Bulletin No. 335 for rearing of chicks.

Those going in for turkeys should set every egg this month and the two following months, for it is the chicks from these which are going to get the highest prices next Christmas.

Hatch as many ducklings as possible; the youngsters thrive better in the cooler weather and make better breeding stock for the future than those reared in the hotter weather. The breeding ducks must have water to swim in if good fertile eggs and strong ducklings are to be expected.

STOCK.

Cattle.—The precautions recommended for February apply equally to March. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed.

VEGETABLE GARDEN.

Tomatoes, peas and beans should be in full bearing, and should be staked and tied. Weeding and cultivation should be extensively carried out. Seeds for late winter crops—beans, cabbage, cauliflower, peas, radish, turnips, spinach and beet—should be sown.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

Weather Bureau.

RAINFALL.

STATION.	1919.		Seasonal to 31st December, 1919.
	November.	December.	
MASHONALAND—			
Charter—			
Bushy Park	3·34	4·22	9·14
Enkeldoorn Gaol	5·58	6·20	14·32
Marshbrook	3·47	3·46	8·90
Range	2·63	5·62	11·21
Riversdale	1·92	4·97	8·09
Vrede	4·45	2·53	8·73
Wylde Grove	3·55	3·65	9·29
Chibi—			
Lundy River	1·35	5·19	7·21
M'Rumi	2·30	3·00	5·30
Nuanetsi Ranche	1·79	4·29	—
Chilimanzi—			
Driefontein	2·95	3·64	8·81
Felixburg	3·19	5·38	10·48
Induna Farm	7·11	4·23	14·24
M'tas Halt (Railway)	4·47	3·62	—
Orton's Drift	—	—	—
Umvuma (Railway)	6·99	4·25	14·12
Darwin—			
Mount Darwin	5·19	3·04	9·21
Gutu—			
Eagle's Nest Ranche	4·32	6·17	12·87
Gokomere	2·47	4·88	8·61
M'vimvi Ranche ...	4·50	5·14	11·19
Noeldale	3·94	6·62	12·45
Hartley—			
Ardgowan	3·67	3·96	9·02
Battlefields (Railway) ...	2·40	1·84	5·90
Beatrice (B.S.A.P.) ...	2·74	5·55	10·58
Cringleford	3·11	9·40	14·32
Elvington	2·08	3·54	8·66
Franceys Farm	3·64	5·63	9·90
Gadzema (Railway)	3·43	8·83	14·21
Gowerlands	4·73	4·31	11·57
Hallingbury	5·93	4·88	11·81
Hartley Gaol	3·26	5·98	10·06
Makwiro (Railway)	2·32	12·42	18·31
Ranwick	3·94	4·46	9·43
Shagari (Chevy Chase) ...	2·58	5·89	9·52
Spitzkop	2·19	2·93	—

RAINFALL—(*Continued*).

Station	1919.		Seasonal to 31st December, 1919.
	November.	December.	
MASHONALAND—(Continued)			
Inyanga—			
Inyanga	3·97	7·46	12·63
Inyanga Settlement	2·31	7·63	12·55
Rhodes Estate	4·57	7·62	15·30
St. Trias' Hill	2·80	6·52	13·65
York Farm	3·19	6·69	11·55
Lomagundi—			
Argyle	4·94	11·02	17·21
Banket Junction (Railway) ...	3·15	6·83	—
Darwendale	3·74	4·00	8·25
Duxbury Farm	4·74	10·47	16·36
Gambuli (Mukore)	3·68	9·26	14·32
Lone Cow Estate	3·48	5·31	10·24
Longmead	4·32	8·85	14·25
Mukwe River Ranche... ...	3·65	9·53	14·50
Palm Tree Farm	5·27	11·16	18·67
Sinoia	4·81	8·55	14·50
Umvukwe Ranche	4·96	3·97	10·39
Makoni—			
Carlow Farm	2·17	7·43	10·97
Chimbi Source	7·02	5·43	—
Craigendoran	2·97	8·34	13·33
Delta	3·03	6·53	12·08
Forest Hill	5·76	4·56	15·86
Gorubi Springs	4·93	8·37	14·67
Headlands (Railway)	4·76	4·87	—
Mona	6·86	4·65	14·35
Monte Cassino Mission ...	7·87	8·78	17·96
Odzi (Railway)	4·20	6·93	—
Rusape (N.C.)	4·55	7·41	13·60
Springs	4·76	7·99	—
Marandellas—			
Bonongwe...	3·40	4·55	10·72
Huish Estate	3·29	5·64	11·14
Macheke (Railway)	3·26	6·10	13·14
Marandellas	6·36	4·79	13·90
Nelson	4·64	2·67	9·42
Selous Nek	4·62	6·24	12·19
Tweedjan	1·40	6·60	10·60
Mazoe—			
Avonduur	2·70	4·76	—
Benridge	3·26	2·47	7·08
Bindura	2·28	3·68	7·15
Ceres	4·27	5·10	10·16
Chipoli	8·18	3·91	14·06
Citrus Estate	2·20	6·94	10·04
Concession (Railway)	3·90	4·87	10·09
Dunmaglas	3·06	3·22	7·64
Glendale (Railway)	2·35	4·93	8·63
Kilmer	2·53	5·76	9·12
Kingston	3·82	3·39	8·11

RAINFALL *(Continued)*.

STATION	1919.		Seasonal to 31st December, 1919.
	November.	December.	
MASHONALAND—(Continued)			
Mazoe—continued			
Mazoe Dam	3·93	5·93	10·71
M'Guta	3·66	2·42	6·77
Ruia	3·10	4·48	9·01
Ruoko Ranche	4·14	5·21	11·36
Shamva	3·27	4·11	8·23
Stanley Kop	3·76	6·56	11·44
Sunnyside	4·01	5·07	10·17
Teign	4·16	6·41	12·14
Virginia	2·22	3·27	6·85
Volynia Ranche	2·70	3·34	6·58
Melsetter—			
Brackenburg	2·77	8·73	14·93
Chikore	0·50	5·95	—
Mount Selinda	3·07	8·37	14·34
Tom's Hope	4·27	4·92	12·08
Vermont	2·46	6·07	12·98
Mrewa—			
Glen Somerset	7·17	8·25	—
Mtoko—			
Makaha	1·85	4·76	6·91
Mtoko	4·13	3·30	—
Ndanga—			
Bikita	3·04	14·80	19·65
Marah Ranche	2·97	7·59	10·92
Salisbury—			
Ardbennie	4·70	7·99	14·51
Avondale	5·43	6·14	14·31
Borrowdale (Hatcliffe)	2·95	6·54	—
Bromley	4·28	8·11	12·94
Chishawasha	2·30	5·11	9·19
Goromonzi	4·87	8·75	14·85
Gwebi	4·84	7·82	13·98
Lilfordia	4·55	7·53	12·90
Meadows (The)	4·14	2·48	9·36
Salisbury (Gaol)	4·87	7·29	14·60
Selby	4·81	5·54	11·50
Stapleford	5·89	9·30	17·75
Vainona	4·60	6·62	13·82
Umtali—			
Hoboken	5·05	4·98	13·64
Muromo Ranche	—	—	—
Odzani	4·66	5·95	12·12
Odzi Drift	3·01	6·97	12·65
Penhalonga	4·88	8·07	15·86
Premier Estate	2·77	7·58	11·04
Reservoir, Umtali Municipality	3·81	5·76	11·51
Sarum	2·49	5·25	9·77
Stapleford	6·59	8·01	18·73
St. Augustine's Mission	4·10	8·27	14·93
Stralsrund	3·42	4·69	9·37

RAINFALL *(Continued).*

STATION	1919.		Seasonal to 31st December, 1919.
	November.	December.	
MASHONALAND—(Continued)			
Umtali—continued			
Umtali (Gaol)	3·43	5·77	—
Victoria—			
Brucehame	2·22	3·76	6·65
Clipsham	2·53	3·14	6·32
Makorsi River Ranche ...	1·35	6·97	9·16
Silver Oaks	2·42	4·06	8·48
Summerton	1·65	4·94	7·32
Victoria	3·16	6·29	10·10
MATABELELAND :			
Belingwe—			
Bickwell	4·10	2·05	8·51
Tamba	2·17	3·47	5·81
Wedza	3·28	2·73	7·40
Bubi—			
Bembesi (Railway)	2·20	4·02	6·72
Imbesu Kraal	2·98	6·15	9·76
Inyati	2·16	6·91	10·16
Shangani Estates	3·09	5·16	9·85
Bulalima-Mangwe—			
Empandeni	1·59	3·13	4·79
Figtree	1·54	3·40	5·35
Garth	1·80	4·82	6·83
Maholi	2·81	3·71	—
Retreat	1·93	4·25	7·16
Riverbank Farm	3·46	1·61	5·62
Solusi Mission	2·30	1·27	3·87
Tjompani	2·35	3·12	7·30
Bulawayo—			
Keendale	2·72	3·48	6·63
Fairview Farm, Khami Siding ...	2·45	1·85	—
Lower Rangemore	2·74	3·41	6·84
Observatory	2·27	2·07	4·85
Umgusa	2·56	6·35	9·41
Gwanda—			
Antelope Mine	1·39	4·39	5·86
Gwanda (Gaol)	2·41	2·41	5·99
Lamulas	4·73	2·47	7·60
Langalanga	0·97	3·83	4·97
Makalali	2·16	3·60	5·76
Manantji	0·88	1·40	2·38
M'Pande	1·16	2·80	4·33
Mtshabezi Mission	3·06	3·30	7·08
Sovelele	3·25	3·85	7·50
Tuli	1·93	1·09	3·16
West Nicholson (Railway) ...	2·99	2·37	5·36

RAINFALL *(Continued).*

STATION	1919.		Seasonal to 31st December, 1919.
	November.	December.	
MATABELELAND—(Continued)			
Gwelo—			
Dawn	3·79	3·69	8·51
Globe and Phœnix Mine	2·74	2·65	9·02
Globe and Phœnix (Railway)	2·63	3·21	9·65
Gwelo (Gaol)	6·00	6·10	14·20
Hunter's Road	3·40	3·31	8·23
Lalapanzi (Railway)	4·08	5·74	12·83
Lovers' Walk	4·19	4·04	9·58
Lower Gwelo (Somerset Estate)	3·46	4·19	10·18
Rhodesdale Ranche	4·73	2·46	8·40
Rio, Iron Mine Hill	2·24	7·11	10·90
Riverdale	3·87	5·42	10·77
Sikombela Farm	3·81	3·77	—
Insiza—			
Albany	2·61	5·18	8·84
Filabusi	4·91	2·00	7·01
Infiningwe	3·22	4·37	7·93
Insiza (Railway)	4·81	7·74	14·11
Orangedale	2·85	6·88	—
Roodeheuvel	3·63	4·03	8·73
Shangani (Railway)	2·69	4·81	8·60
Thornville	1·82	7·32	10·47
Matobo—			
Matopo Mission	2·24	4·92	9·06
Rhodes Matopo Park	3·33	3·04	6·70
Nyamandhlovu—			
Edwaleni	1·99	5·16	7·66
Impondemi	0·64	4·43	—
Naseby Farm	4·53	2·77	7·80
Nyamandhlovu (Railway)	2·31	2·86	7·39
Sebungwe—			
Gokwe	3·65	4·55	10·20
Inyoka	4·62	5·55	11·26
Selukwe—			
Hillingdon	2·78	10·06	13·78
Selukwe (Railway)	2·84	8·31	13·21
Umzingwane—			
Essexvale	2·02	3·31	6·80
Heany Junction (Railway)	2·88	4·41	8·37
Hope Fountain	1·79	3·86	—
Ntabenende	3·72	4·44	8·95
Springs Farm	1·54	4·86	7·14
Wankie—			
Dett (Railway)	4·80	6·53	14·00
Lynwood's Estate	2·46	5·60	9·12
Ngamo (Railway)	1·74	7·93	10·32

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1920		
			February	March	April
Bembesi	Queen's Mine Hotel	V. C. Andrews	6	5	2
Bindura	Bindura	G. Askew	14	13	10
Bromley	Bromley	C. J. Shirley	5	4	1
Charter—Mgezi	Farmers' Hall, Beatrice	W. Krienke	26	25	29
Central	Umvuma	W. A. James	28	27	24
Darwin	Darwin	H. Wessels	8	7	4
Eastern Border (South Melsetter)	Helvetia	——	13	12	9
Eastern Districts	Good Hope Farm	G. F. Robertson	14	13	10
Enterprise	February—Alderley Farm March—Meadows Farm	R. Philip	4	3	7
Felixburg—Gutu	Felixburg	R. H. Brown	..	..	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	H. Charles	7	6	3
Gatooma	Gatooma	——	No	fixed	dates
Gazaland	Chipinga	J. Myers	14	13	10
Greystone	Various farm houses, Shangani	M. Kerr	14	13	10
Hartley	Hartley	J. de L. Nimmo	28	27	24
Headlands	Headlands	J. Grewar	No	fixed	dates
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. W. Twilley	14	13	10
Insiza—Shangani	Shangani	C. H. Lewis	21	..	17
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	14	13	10
Inyazura	Inyazura	H. B. Curling	18	17	21
Iron Mine Hill	Iron Mine Hill	T. Irving	14	13	10
Lalapansi	Lalapansi	B. J. Ingle	21	20	17
Lomagundi	Sinoia	A. H. Layard	28	..	3
Macheke	Macheke	——	No	fixed	dates
Makwiro	Makwiro	D. M. Syme	20	19	23
Makoni North	Makoni	J. G. Monckton	28	27	24
Makoni	Rusape	R. C. Maclagan	14	13	10
Marandellas, Northern	Marandellas Farmers' Hal	J. Thakara	7	6	8
Marandellas, Southern	Inoro	J. Gibberd	4	3	7
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	4	3	7
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed	dates
Matopo Branch, R.L. and F.A.	Sibali	——	No	fixed	dates
Mazoe	Glendale Siding	Mrs. Yoxall West	11	10	14
Melsetter North..	Various farms	N. N. Rutherfurd		27	..
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	13	12	16
Northern Umtali	Farm Summerfield	A. Tulloch		27	..
Norton and District	Norton Store	W. Wrench	7	6	3
Que Que	Que Que	E. J. Ross	21	20	17
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	13	12	16
Selous	Various farms	A. L. Douglas	21	20	17
Selukwe	Selukwe	E. E. Somerset	No	fixed	dates
Shamva	Shamva	R. C. Frith	..	17	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	14	13	10
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	14	13	17
Umtali	Royal Hotel, Umtal	J. S. Holland	5	4	1
Victoria	Victoria	——	6	5	2
Vungu	Vungu	J. H. Erasmus	..	..	
Western	Plumtree Hotel	A. Barclay	14	13	10

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Co-operative Experiments

The under-mentioned seeds of winter cereal crops will be available, after the 15th February, for free distribution under the usual terms of co-operative experiments. Several of these cereals have already been proved suitable for winter cropping on moisture-retaining vlei soils without irrigation. Rye and emmer are suited to the poorer soils, and are particularly valuable for supplying green fodder either for grazing or soiling.

Early Gluyas Wheat, Florence Wheat, Black Persian Wheat (*durum*), Cape Early Rye, Cape Early Barley, Emmer, Texas Oats.

N.B.—Not more than three kinds can be sent to any one applicant.

HANDBOOK OF TOBACCO CULTURE for Planters in Southern Rhodesia. Sold by the Department of Agriculture. 2/6.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.
No. 189. The Manuring of Maize on the Government Experiment Farm. Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 206. Hints on Irrigation : Small Earthen Storage Reservoirs, by W. M. Watt.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs. Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them. by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 239. Reports on Crop Experiments, Gwebi. 1915-16, by E. A. Nobbs. Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs. Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 260. Rhodesian Farm Orchard, by A. G. Turner.

No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 269. Farming in Granite Country, by R. C. Simmons.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 296. Citrus Nursery Work, by A. G. Turner.

No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.

No. 305. Manure Supplies, by E. V. Flack.

No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.

No. 315. Descriptive List of Trees and Shrubs at Forest Nursery.

No. 320. Maize Grading, by C. Mainwaring.

Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E

No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.

No. 342. Rotation Experiments, 1913-1919, by H. G. Mundy, F.E.S., and J. A. T. Walters, B.A.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.

No. 106. Cultivation and Preparation of Ginger.

No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.

No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.

No. 162. Rhodesian Maize. The Principal Types and their Points, by J. A. T. Walters, B.A.

No. 163. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.

No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.

No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.

No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.

No. 179. Buckwheat, by H. G. Mundy, F.L.S.

No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.

No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.

No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.

No. 194. Rye, by J. A. T. Walters, B.A.

No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.

No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.

No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.

No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.

No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.

No. 253. Wheat Production in Southern Rhodesia.

No. 258. Winter Wheat, by J. A. T. Walters, B.A.

No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.

No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.

No. 285. The Mexican Marigold, by F. Eyles, F.L.S.

No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.

No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.
No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.
No. 327. Linseed, by C. Mainwaring
No. 333. Tobacco Culture—Field Operations, by H. W. Taylor, B.Agr.
No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 339. Tobacco Culture; Harvesting and Curing, by H. W. Taylor, B.Agr.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.
No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.
No. 291. Cutworms, by Rupert W. Jack, F.E.S.
No. 295. Tsetse Fly in Southern Rhodesia, 1918, by Rupert W. Jack, F.E.S.
No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 65. Common Ailments of the Horse, by D. R.. Chatterley, M.R.C.V.S.
No. 82. Difficult Parturition of the Cow, by C. R. Edmonds, M.R.C.V.S., G.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.

No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.
No. 312. Anthrax, by C. R. Edmonds, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
No. 316. Inoculation of Cattle against Redwater and Gall-sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 324. Infectious Abortion of Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
Services of Government Veterinary Surgeons.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 319. The Turkey, by Arthur Little.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 325. Contagious and Infectious Diseases of Poultry, by A. Little.
Strength of Cattle Dips.

No. 330. Poultry Keeping in Rhodesia—Incubation, by A. Little.
No. 331. Theory and Practice of Feeding Cattle in Southern Rhodesia, Part I., by R. C. Simmons.
No. 332. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part II., by R. C. Simmons.
No. 335. Poultry Husbandry: The Rearing of Chicks, by A. Little.
No. 336. Butchering and Flaying.
No. 337. Poultry Diseases: Enteritis, Tuberculosis, Coccidiosis.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 340. Notes on Theory and Practice of Feeding Cattle in Southern Rhodesia, Part III., by R. C. Simmons.
No. 343. Poultry Husbandry; Breeding and Selection for Increased Egg Production, by A. Little.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 205. Home Butter Making, by R. C. Simmons.
No. 226. Classification of Clouds.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
No. 328. Pont l'Eveque Cheese, by J. B. Fisher, N.D.D.
No. 329. Gervais Cheese, by J. B. Fisher, N.D.D.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Irrigation—Advice.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS VACANT.

Post as learner on tobacco farm near Salisbury. Apply W. T. G.

Wanted at once, young man as assistant on tobacco plantation of 60 acres. Must be energetic and willing. Some previous farm experience preferred, but not essential. Apply J. H. W.

SITUATIONS WANTED.

R. B. S.—As manager of farm, or crop and soil specialist on large estate. Practical experience in Transvaal and Rhodesia.

A. D.—Management of farm wanted by man of wide experience in stock farming and agriculture in Cape Colony and Rhodesia; good references.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal.* This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 552 of 1919.] [12th December, 1919.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Acting Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 338 of 1919, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard areas in lieu thereof :—

MELSETTER NATIVE DISTRICT.

(a) *Areas of Infection.*

The farms Grasslands, Sawerombi, Mermaid's Grotto, Nooitgedacht and Morgensen.

(b) *Guard Areas.*

1. An area comprising the farms Ruwaka, Honey Kloof, Greyville, Murari, Lime Cliffs and the Mutambara Reserve, excluding a strip of four miles along the Odzi River.

2. An area comprising the farms Welgegund, Riverange, Camperdown, The Drifts, Nyanyadzi, Biriwiri, Admiral, Cambridge, Outspan, Fairfield, Commonage and Westfields.

3. An area comprising the farms Forest Glade, Glencoe, Ngoroma Reserve, Bloemhof, Lavinia's Rust, Orange Grove, Springfield, Springvale, Tarka and Hayfield.

4. An area comprising the farms Clearwater, Wedgehill, Newcastle, Woodstock, Inhoek, Avontuur, Vorspoed, Sterkstroom and Randfontein.

No. 566 of 1919.] [19th December, 1919.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 337 of 1919, and declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area in lieu thereof :—

GWELO NATIVE DISTRICT.

(a) *Area of Infection.*

Farms Clearwater and Northfield.

(b) *Guard Area.*

An area bounded by a line drawn from the north-eastern beacon of the Que Que Reserve along the south-eastern boundary of the same to the western beacon of Lochiel, thence including plots Nos. 80, 82, 84, 83 and 79 on the Umsungwe Block to the north-eastern beacon of the Fife Scott Block, thence including the farms Rutlandshire, Cambridgeshire, Cheshire, Warwickshire, Derbyshire, Avondale, Broomrigg, Retreat, Ranche, Stormville, Dunlop, Mapani, thence along the south-western, western, northern and eastern boundaries of the Main Belt Block to the north-western beacon of Erin, thence along the western and southern boundaries of same and the southern boundary of Igogo to the Bembezaan River, thence up the latter to its junction with the Nyamaweri River, and up the latter to the north-eastern beacon of the farm Ashdale, thence in a direct line to the point first named.

No. 35 of 1920.] [16th January, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area.

UMTALI NATIVE DISTRICT.

(a) *Area of Infection.*

The farms N'Odzi, Nyagari, "B" Farm, Mabonda, Banks and Drennan.

(b) *Guard Area.*

An area from the south-east beacon of Holdenby, then along the northern boundary of Umtali native district to the Odzi River; thence down the Odzi River to its junction with the Odzani River, then following this river to the north-east beacon of Savillen farm; thence including the latter farm, Umtali Mission, Fairview, N'gambi, Barrydale, Ferndale, Fairholm, Forrest farm; thence along the southern boundary of M'bezi Plots to the eastern border of this Territory; thence in a northerly direction along this boundary to the point started from.

No. 541 of 1919.] [5th December, 1919.

APPLICATION FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of Applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
J. Rademeyer	Rurgwe	Ndanga	Farm Doornfontein

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 562 of 1919.] [19th December, 1919.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
P. B. C. Owen	Little Sebakwe	Chilimanzi	Farm Sandfontein

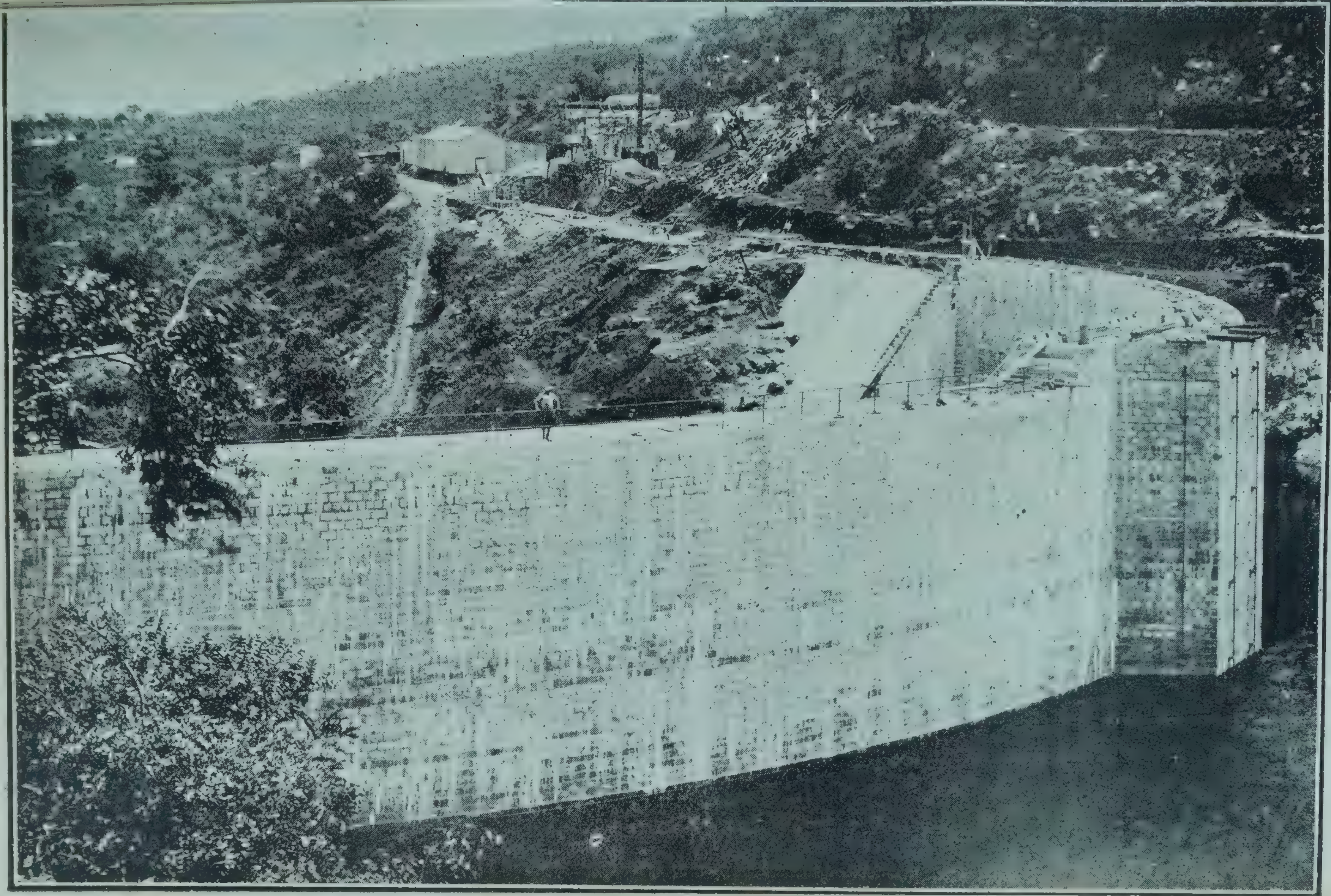
Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

Erratum.

Journal.—December, 1919.

Subject.—Gwebi Experiment Farm ; report on crop experiments, 1918-19.

Correction.—Inscription to illustration facing page 538 : substitute "Sudan Grass" for "Emmer Wheat"; similarly substitute "Emmer Wheat" for "Sudan Grass" on illustration facing page 540.



Mazoe Dam.

THE RHODESIA

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assisted by the Staff of the Agricultural Department.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

Ground Nuts (*Arachis hypogea*).—Latest advices from London shew that ground nuts are fetching £52 a ton; in Johannesburg the price is ranging from 35/- to 40/- per bag of 100 pounds. At these figures the growing of ground nuts can be looked upon as a particularly "good thing," and we therefore direct the attention of farmers to the opportunity offering. The average yield per acre throughout this Territory last year was a little in excess of six bags of 83 pounds, but yields have been obtained up to 35 bags, while a normal crop usually amounts to 10 to 15 bags per acre. The growing of ground nuts in

Rhodesia has hitherto for the most part been regarded as an unimportant side line, the prices obtained being insufficient to induce farmers to pay much attention to the crop. The position is different to-day, and there exists a world-wide demand for vegetable oils. Ground nuts may be grown as a change crop to maize, and this, as well as being good farm practice, should pay handsomely.

Some striking figures in regard to ground nuts are to hand from America, where in a very large section of Georgia, Florida, Alabama and South Carolina the boll weevil has made the growing of cotton out of the question. These farmers have found in ground nuts, or pea-nuts, as they are called, their salvation, and to-day in Coffee County, Alabama, alone, the crop is said to be worth 4½ million dollars, while cotton is still grown in addition. Alabama is the largest pea-nut producing State of America, and a million acres are annually devoted to the crop. A great industry in pea-nuts has been built up in America. New uses have been found for pea-nut products, until it has assumed rank among the nation's great products. Pea-nut oil refineries have built up a trade for pea-nut oil and pea-nut butter among the American people. Pea-nut manufacturers and packers of salted pea-nuts have advertised and pushed their wares to the front, and have built up a trade of enormous proportions. After harvesting the crop, some American growers turn in pigs to clear up such nuts as are left in the ground, and in one case where 300 hogs were turned into a pea-nut field they gained an average of 75 pounds per hog.

It is doubtful whether the conditions in Alabama for the growing of ground nuts are more favourable than those in Rhodesia, and we feel sure that with better cultural methods and the use of up-to-date machinery this crop will be found to give much higher returns than statistics shew. The prices we have quoted are very attractive, and there does not appear to be any immediate prospect of a fall, in so far as the European market is concerned. We would, therefore, advise farmers to give the matter of growing ground nuts their serious consideration.

Veld Improvement in Rhodesia.—We publish in this issue an article by Mr. H. G. Mundy dealing with the improvement of Rhodesian pastures. There is an insistent demand for information on this subject, but it must be admitted that the data at present at our disposal are mainly of a negative character, and therefore do not assist very much in solving the difficulty.

As will be seen from a perusal of the article, practically all the exotic grasses tried at the experiment station have proved unsatisfactory for use in this country, and present experiments are being principally devoted to the testing of indigenous grasses. Such tests must of course be extended over a number of years, and considerably more experience must be obtained before definite conclusions can be drawn. Encouraging results have, however, been obtained with certain species, and we think the time opportune to bring these to the notice of the public in order that farmers and others interested may be in duced to co-operate in this work. With this object in view, Mr. Mundy tenders advice in regard to the establishing of trial plots and the subsequent cultural methods to be followed.

The subject is one of the greatest importance to this country, and we trust that farmers will assist in the manner indicated, and will also bring to the notice of the Department any grass which is considered possesses any particular merit.

Cotton Growing in Rhodesia.—We have received the report of the Empire Cotton Growing Committee, summarised accounts of which have already appeared in the daily Press. The committee was appointed by the Imperial Government in 1917 to "investigate the best means of developing the growing of cotton within the Empire, and to advise the Government as to the necessary means to be taken for this purpose."

The committee find that—

(1) the world is short of cotton, and the shortage is increasing;

(2) the shortage is greatest in the finer kinds of cotton which Great Britain uses so largely, and is generally more serious for Great Britain than any other country;

(3) 85 per cent. of the cotton used in Great Britain comes from the United States of America, which every year itself consumes more of its own cotton;

(4) the British Empire can (with proper development) grow the quantity and quality of cotton that it requires;

(5) cotton growing brings prosperity to the places suited to it.

In regard to Rhodesia, the committee report:—

"We think it desirable that the possibilities of Rhodesia should be more fully explored, since, although none of the districts where pioneer work has been undertaken can be regarded as likely to produce a large cotton crop in the early future, they apparently possess possibilities for further development which may prove valuable later on.

"The addition of cotton experts to the otherwise well-equipped Agricultural Department is essential before progress can be expected."

In regard to the latter paragraph, as is known, a cotton expert in the person of Mr. H. W. Taylor has since been appointed to the staff of the Department of Agriculture. In addition to this appointment, provision has been made in the current estimates for the appointment of an assistant.

In Southern Rhodesia this season 90 farmers are growing cotton, and the area under the crop is approximately 1,000 acres. All this is work of an experimental nature, undertaken with a view to testing the possibilities of this country for cotton growing. As soon as the present crop is harvested, a detailed report will be published in this *Journal*, giving the yields per acre, costs of cultivation and the profits accruing.

Mexican Marigold (*Tagetis minuta*). In connection with the editorial reference to this subject, made in the previous issue of this *Journal*, it is pleasing to note that the Beira and Mashonaland and Rhodesia Railways and the Municipalities of Bulawayo, Gwelo, Salisbury and Umtali are taking active measures for the eradication of this weed. Native Commissioners are also pointing out to the natives the evil consequences of the spread of marigold to their lands, and a vigorous war of extermination is being waged. This so far is very satisfactory, but it is discouraging to notice the very considerable areas of marigold which still exist on private farms. It would appear that some farmers are not giving this matter the attention it requires, and we might here remark that unless farmers themselves keep their lands clear, they cannot expect public bodies to continue their efforts to eradicate the pest. The weed is rapidly becoming a serious menace to the agricultural industry of this country, and we would again urge those farmers concerned to take all possible measures to combat it.

Inoculation against Horse Sickness.—It is hoped that during the coming winter a limited quantity of vaccine will be available for the inoculation of young horses having no permanent teeth. The inoculation will be performed by the professional officers of the Veterinary Department, subject to certain conditions which will be decided later. A charge of £1 per dose of vaccine for every animal inoculated for the first time, and 5s. for each animal re-inoculated, will be collected before inoculation. Inoculation will be carried out entirely at owner's risk.

It has been found that some animals possess a certain degree of natural resistance sufficient to overcome the vaccine, from which they thus derive no additional immunity. This resistance being lost with increasing age, the animal is left susceptible to natural infection. It is therefore recommended that horses be re-inoculated every year before the onset of the horse sickness season.

The value of inoculation has been well shewn during the present season among inoculated Police horses, of which over two hundred have been exposed throughout the country without a single death from horse sickness having occurred among them, although the mortality among uninoculated horses exposed to similar risks has been as great as usual.

Owners of young horses suitable for inoculation are invited to apply direct to the Government Veterinary Bacteriologist, P.O. Box 257, Salisbury at an early date, specifying the number of horses they desire to be treated; arrangements will then be made to inoculate as many animals as possible under conditions which will be published later.

African Coast Fever.—We publish in this issue Mr. Bevan's article on African Coast Fever which appeared in the *Journal* for August, 1915. The article has been revised and brought up-to-date, and will be available in bulletin form.

The next two months—viz., April and May—are generally regarded as the most dangerous ones for Coast Fever. This is correct in so far as that it is during these months infection which has been in existence for some time manifests itself, due no doubt to the climatic conditions being more favourable to tick life. Farmers near known infected areas are therefore urged to pay particular attention to all cases of sickness and death, and where not satisfied as to the cause, to report to the nearest official, forwarding blood and gland smears for examination.

Two fresh outbreaks have to be recorded in the Mazoe district; one on the farm Rocky Spruit, adjoining the original centre of infection, and the other on the farm Sleamish, which adjoins Rocky Spruit. At the previously infected centre in this district, viz., Avonduur and Leopard's Vlei, and also at the Hunter's Road centre, in the Gwelo district, the death rate was heavier than during the previous month; this is probably due, to some extent at any rate, to the heavy rains interfering with the efficacy of dipping. As expected, the death rate at the Matobo centre was heavy, but it is satisfactory that careful inspection in a large area around the known infected centres did not result in the discovery of any further infection.

Engineering Advice to Farmers.—We publish in the Government Notices at the end of this *Journal* the terms and conditions under which engineering advice may be obtained by *bona fide* farmers and others. As will be seen, a charge will in future be made in cases involving field work or special office work, the charge varying according to circumstances. This is in accordance with the practice in the Union.

It will be noticed that informal advice of a general character may still be given free of charge, providing field work or special office work is not entailed.

The Cattle Owners' Association of Rhodesia.—We welcome the formation of this association, which came into being in February of this year. The headquarters of the association are at Bulawayo, and the following are the officials to date:—President, Mr. St. Charles B. Gwynn; vice-presidents (Matabeleland other than Gwelo and the Midlands), Major F. F. G. Chomley and Major R. Gordon; committee members for Matabeleland other than Gwelo and the Midlands, Major J. C. Coope, Major G. R. Gildea Robertson, and Messrs. H. G. M. Huntley, A. H. Mitchell, J. P. Richardson, C. Drummond Forbes and J. H. Bookless.

Officials to represent Mashonaland have not, at the time of writing, been elected, a meeting called for this purpose having to be postponed on account of the railway strike.

The primary object of the association, as stated in the articles, is to promote and safeguard the cattle industry as a branch of agriculture.

Any person, partnership, syndicate, limited liability company or association whose principal agricultural interest is in cattle is eligible for membership, but the executive committee decide as to the eligibility of any applicant for membership. The entrance fee is two guineas, and each member has to pay annually an assessment of one penny per head of cattle and horses, excluding calves and foals, born during the preceding year, owned or controlled by him, up to 250,000. One halfpenny per head is charged in excess of that number, but no member may pay less than one guinea.

There is ample scope in Rhodesia for such an association, and we trust that it will receive the support from this portion of the Territory that it has in Matabeleland.

Fertilisers and Farm Foods.—A new set of regulations governing the sale of fertilisers and farm foods was published in the *Government Gazette* dated 19th March, 1920. These regulations are too lengthy for publication in the *Journal*, but it is hoped in our next issue to publish an article explaining the objects and provisions of the Ordinance and the regulations now in force.

The "Journal."—In common with other activities in the Territory, the *Journal* has been affected by the railway strike, and publication of this number has been delayed. This is owing to the fact that it was impossible to send the photographs to Johannesburg at due date for blocks to be made, and a delay of a fortnight occurred. It is our endeavour to produce the *Journal* as near the first of the month of publication as possible, and we trust no untoward event will prejudice our efforts.

Improvement of Rhodesian Pastures.

By H. G. Mundy, F.L.S., Government Agriculturist and Botanist.

During the past ten years one of the most important lines of work carried out by this branch of the Department of Agriculture has been the introduction and trial of the better known exotic (*i.e.*, not native) pasture plants and grasses from almost every part of the world, with the object of finding some which, owing to frost and drought resistance, would, without irrigation, provide good grazing during the dry season. It is not proposed here to discuss annual grasses, as such are not suitable for permanent pastures, nor can the many perennial kinds which have failed be enumerated in detail. Suffice it to say that, so far as pasture plants are concerned, no general success has been obtained with any of the clover family or with sainfoin, and very little with either dry-land lucerne or the hardier pasture plants such as goat's rue, sheep's burnet, millefoil, plantain and chicory. Amongst the grasses, all those best known in Europe, Australia, America and New Zealand have been tried, but in almost every case without sufficiently good results to justify their being recommended for this country. Further, between the years 1910 and 1914 many hundreds of pounds weight of seed of the fescues, brome grasses, cocksfoot, paspalum and sheep's burnet, as well as smaller amounts of all the other more promising kinds, were issued to farmers in all parts of the Territory, yet it must be confessed that with the exception of small areas of paspalum, seeded either then or subsequently, there remains to-day little if any trace of these introductions.

Grasses Indigenous to Africa.—The long dry season is without doubt the primary cause of the failure of these exotic grasses and pasture plants, and since introductions from other parts of the world, which at first seemed the most promising line of advance, have failed, the obvious alternative is to devote more attention to the isolation and study of the best of the native grasses. Two of the most popular hay grasses at present grown in South Africa—namely, teff grass (*Eragrostis abyssinica*) and Sudan grass (*Andropogon sorghum sudanensis*)—are of African origin, while Napier fodder or elephant grass (*Pennisetum purpureum*), which is so rapidly gaining popularity as a coarse fodder for dry districts in Australia and parts of the United States of America, is a native of Rhodesia, and was first grown and proved as a cultivated fodder crop on the Salisbury Experiment Station. These facts encourage one to believe that, given careful study, there are still many valuable grasses to be found in the country, which only need to be better known to be appreciated at their full worth.

Rhodesian Grasses.—While primary attention in the past has been devoted to the introduction of exotics, the merits of our Rhodesian grasses have not been altogether overlooked, and there are on the experiment stations to-day, apart from the two kinds of Napier fodder, several other native grasses of outstanding merit which have been under observation for three to six years, which are perennial and which will certainly come in time to be recognised as amongst our most valuable grasses.

Plate No. 1 shews a few plants of a grass which we have named Rhodesian tussock grass (*Setaria* sp.), and which was first collected in Rhodesia by Mr. J. A. T. Walters in 1916. The plants shewn are three years old, and each clump produces on the average many scores of leafy stalks. One stool selected at random was carrying over seven hundred, and each clump is rapidly increasing in size. When full grown the grass reaches a height of about 3½ feet, and is then a dense leafy mass. The stems remain comparatively soft throughout and never become woody, as do so many other of the native grasses. Rhodesian tussock grass is a shy seeder, but propagates readily by root division. It is a very rapid grower, being from 2 to 3 feet high by mid-December. It lasts well into winter, makes early spring growth in August and can be cut twice at least during the rainy season. It has produced as much as 4 inches of leaf growth in three days. Two lots of tussocks shewn in the illustration were cut as follows:—

(a) Cut 20th January, height 2 feet 9 inches.
Height of growth made by 6th March, 2 feet 6 inches.

(b) Cut 12th February, height 3 feet.
Height of growth made by 6th March, 1 foot 9 inches.

Molasses Grass (*Melinis minutiflora*) is another excellent grass which was originally introduced as an exotic, but has since been found to be native, occurring as it does in a wild state in the Melsetter, Inyanga and Marandellas districts. It grows very strongly and rapidly covers the ground, and is a summer pasturage and possibly a hay grass of great promise.

Two other native grasses—namely, Guinea grass (*Panicum maximum*) and Rhodesian Buffel grass (*Panicum* sp.)—are illustrated in Plate No. 2. In their wild state both these grasses are usually to be found in the shade of bushes or rocks, and, as proof of their palatability, are always heavily fed down by both game and stock. As, however, has been proved by the six-year trial of these grasses, shade is not necessary for the growth of either. The first-named is a coarse, tufted grass, but it is very succulent and is more suitable for grazing, green soiling or conversion into ensilage, than for hay. Superficially it is somewhat like Napier fodder, but the growth is more spreading, the leaves less harsh and the stems less woody. Rhodesian Buffel grass, on the other hand, is a fine-stemmed, leafy grass which makes excellent summer pasturage or hay, and from which two cuttings can be obtained each year in addition to good grazing on the aftermath. In the illustration the grass is shewn in full seed for the second time this season. It

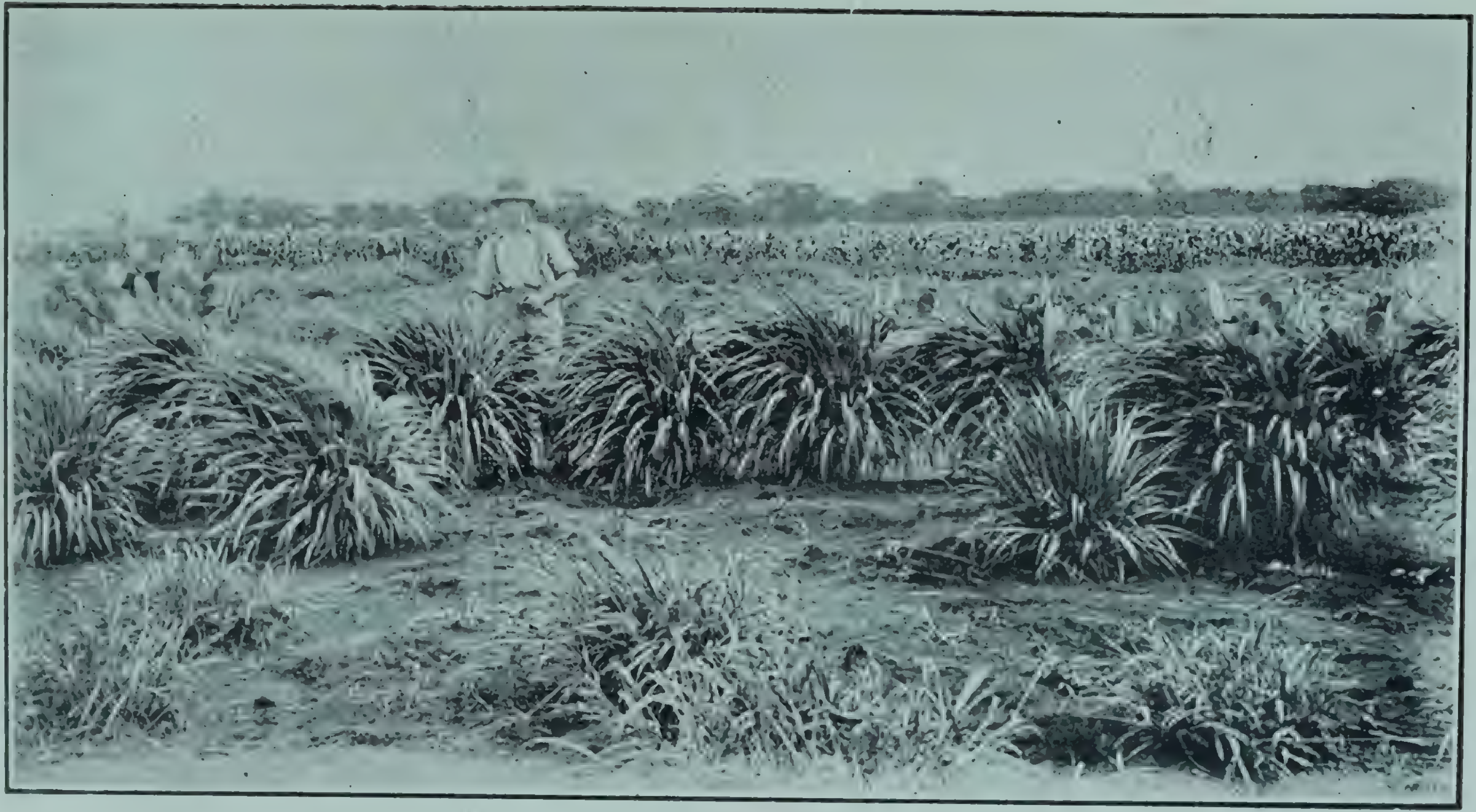


Plate No. 1.—Rhodesian Tussock Grass (*Setaria sp.*) Experiment Station, Salisbury, 11th February, 1920.

Plate No. 2.

Guinea Grass (*Panicum maximum*). Experiment Station, Salisbury.

Rhodesian Buffel Grass (*Panicum sp.*) Experiment Station, Salisbury. (The photograph makes this grass appear coarser than it really is.)

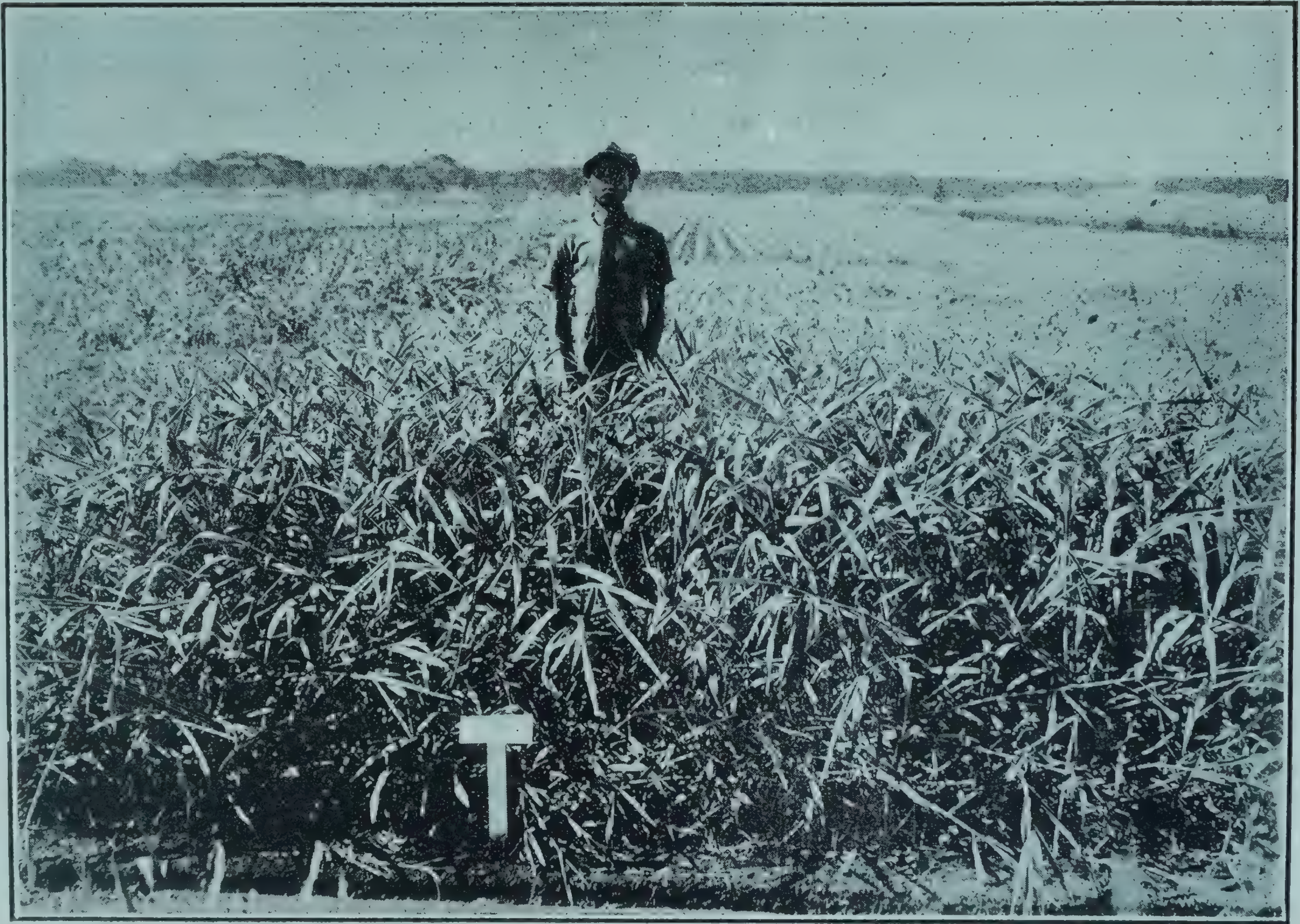


Plate No. 3.—Penhalonga Grass, three months' growth from root division. Experiment Station, Salisbury.

Plate No. 4.

Molasses Grass (*Melinis minutiflora*). Experiment Station, Salisbury.

Kikuyu Grass. Experiment Station, Salisbury.

was first cut for seed this year on 6th January, and the photograph was taken on 2nd March. Both grasses can be propagated from seed. They are not particularly frost-resistant, but are usually freely eaten by stock even after they have lost their succulence.

Colonel Sir Raleigh Grey, who several years ago received a few roots of Rhodesian Buffel grass from this Department, now has an excellent stand of it covering about a quarter of an acre in the vicinity of the Salisbury Kopje, and from which he annually obtains seed, which in turn is being sown on a larger scale on the Belfort Estate.

Plate No. 3 depicts Penhalonga grass, photographed nine weeks after being planted out from slips on 15th December. This is a semi-erect grass, very leafy and with hollow stems. The leaves are smooth, the stems slightly hairy, and the grass is extremely succulent and tender even down to the base. The grass spreads rapidly by means of strong surface runners, which root at the nodes and thus form new plants. It was first collected by Mr. A. G. Turner of this Department with Mr. J. Meikle, on the latter's farms at Penhalonga, but probably occurs elsewhere in Rhodesia as well. It can be cut with a mowing machine, and would lend itself admirably either for hay, silage or grazing. It has not seeded as yet, but can be propagated very easily either by root division or from rooted runners. The illustration well indicates the bulk of fodder which will be produced per acre under suitable conditions. When cut, the growth stood four feet high. It is a late-flowering grass, and has not yet been botanically identified.

To what extent these particular native grasses will remain green during the dry season has not been definitely ascertained, nor do we know the soils which will suit them best. It is probable that no single grass will solve the problem of winter grazing, but while one grass stands well into autumn, another is remarkable for its early spring growth previous to the first rains, and yet a third may continue palatable and nourishing even when mature and dry. One fact stands out clearly, and this is that by the laying down of such grasses, the stock-carrying capacity of our farms in summer can be greatly increased, while by studying their characteristics and combining them in suitable mixtures, the long period during which the unimproved veld yields little or no succulence can probably be considerably reduced.

Kikuyu Grass (*Pennisetum longistylum*).—This perennial pasture grass, of which so many enthusiastic reports have of late been published in local agricultural papers and which undoubtedly appears to be doing remarkably well in many parts of the Union, is again of African origin, coming as it does from British East Africa. It was first introduced to the Salisbury Experiment Station in 1917, and has since been planted largely by several Rhodesian farmers and on a smaller scale by very many more. Reports regarding its ability on dry soils to produce green grazing throughout the dry season are conflicting, and our own experience is as yet insufficient to enable us to pronounce an opinion upon this point. On the heavy red soils it does undoubtedly cover the ground well and rapidly, and makes excellent growth during the rainy season. It also appears to make fairly good spring growth, and if it does this on the dry red soils it may be expected to give even more satisfactory results on rich moisture-retaining vlei soils. Owing to the spreading habit of its growth, which rapidly covers the ground with a dense sward, its establishment must mean increased stock-carrying capacity as compared with unimproved veld, tufted in habit and with a large percentage of the ground uncovered with grass.

The object of the writer in contributing this article to the *Agricultural Journal* is not primarily to advertise the grasses referred to, good as he considers them, but rather to call attention to the very encouraging results which have so far been obtained with native grasses. In almost every case a grass which has at first sight looked promising in the veld has, when brought to the station and isolated there, made even better growth. In other words, all these grasses have responded to cultivation. There is no doubt that as yet we have "spotted" but a few of the many good native grasses. Occasionally grass specimens are received from farmers who have perceived some merit in them and wish to know more about them, but this is far too seldom the case, and it is hoped that in future more of these specimens will be forthcoming and that they will be accompanied by live roots, which can be grown under observation on the experiment station.

Time and again we hear Rhodesia referred to as a cattle country, as it undoubtedly is, but one would hardly guess this if one judged only by the small amount of interest which most cattle owners appear to take in the natural pasturage of their farms and ranches. This lack of interest is reflected in the almost entire absence of local names for our grasses. The unimproved veld is composed of many different species, possessing different characteristics. Many are of excellent quality; not a few are almost worthless, except when growth is quite young. Speaking generally, experience has shewn that veld improvement by sowing down exotic grasses is not to be relied upon. On the other hand, a few very promising indigenous grasses have been isolated and have made remarkable growth, but these will not necessarily prove the best for all parts of Rhodesia, and there are most certainly many others equally good or better which have not yet been noticed.

Improvement by stocking, by cutting and by the prevention of any but judicious burning will do much, as is already recognised, but will this alone go far enough and will it eliminate the less valuable grasses sufficiently quickly?

In one of the early agricultural text-books, namely, "The Farmers' Practical Instructor," published in 1820, the author, A. Lawson, informs us that "in the earlier stages of society little or no labour is required to provide food for the few animals man needs in his rude operations; and herds and flocks, which propagate around him without his care, find the means of subsistence on those extensive wilds on which his feeble exertions have not yet materially encroached. Though he is chiefly indebted to these animals . . . agriculture must have considerably progressed before he attempts to supply their wants by improving their pastures."

This improvement was not begun in England until the middle of the seventeenth century, nor in Scotland until about a hundred years later, when in both countries the importance of live stock began to be fully appreciated. The time is ripe for the active improvement of grass lands in Rhodesia by the elimination of the poorer grasses and the cultivation and encouragement of the better ones. On every farm are to be found grasses of outstanding merit. If but 5 per cent. of stock owners would set themselves the task of establishing small plots of what they consider their best native grasses and add to these such "strangers" of special merit as Kikuyu, paspalum and so forth, it would not be long before veld improvement commenced in real earnest. These trial plots, of a few yards square up to an acre in extent, will not only shew the stock-owner which grasses he should encourage and which he should get rid of, but will provide him with a nursery from which to obtain seed or slips of the best for further propagation. They will also be a source of unfailing interest both to himself and to his neighbours.

A point for consideration is that no perennial grass will for long give good results if it is annually allowed to mature growth and seed. Many of the failures with Napier fodder may be attributed to neglect of this primary rule of grass management. Trial grass plots should in the early stages be kept cut, or grazed if sufficiently well established. If allowed to mature seed, the vigour of the plants is used up, and with the dry season approaching little subsequent growth is likely to be made until the next spring: result, a grass which, had it been treated knowledgeably, might have provided pasturage during the winter months, is perhaps unjustly condemned as a failure.

All grasses, whether originally collected on the farm, obtained from this Department or purchased from other sources, should in the first instance be established in well-prepared nursery beds and should at first receive reasonable attention. Too often, grass roots which are much dried out in transit are planted in any vacant ground and left to shift for themselves. This is a totally wrong policy; as much care is needed in laying down grass land as in growing a crop, and, moreover, too often the failure of a grass to establish itself under adverse conditions prejudices it in the eyes of the farmer. To give an unknown grass a fair trial, plant it first in a small well-prepared plot, which if necessary can be watered until well established. Here its merits can in due course be impartially judged, and if it appears promising, here is the nursery from which further supplies can be drawn to enable it to be tested on the several different soils which are found on most Rhodesian farms. Probably there is one which will suit it better than the others, but because it does poorly on one is not proof that it may not succeed on another.

African Coast Fever.

(REVISED.)

By L. E. W. Bevan, M.R.C.V.S., Government Veterinary Bacteriologist.

In view of the recent serious extension of African Coast Fever in parts of Rhodesia, it has been thought desirable to again publish a few notes for the information of stockmen who have had no previous experience of this much dreaded disease.

History.—East African Coast Fever—or, as it is commonly called in this country, African Coast Fever—was first introduced into Southern Rhodesia during the latter part of 1901, with a number of cattle shipped at Dar-es-Salaam for Beira and Delagoa Bay. These were the balance of a large mob of susceptible cattle brought down from the high veld in German East Africa to the coast, where the disease is enzootic, and where they became infected.

It is alleged that on the voyage south a large number died, and the carcases were thrown overboard. Some of the survivors were landed at Beira, and the ship went on to Delagoa Bay. Of the lot landed at Beira, several truck-loads were sent by rail to Umtali, and two loads went on to Salisbury. The disease broke out amongst both lots, but its true nature was not recognised; and from these centres it extended over the main transport roads of Rhodesia, and also to many farms adjacent to the roads.

During the first few years, the losses from the disease among stock owned by Europeans were enormous, and it was estimated that some 95 per cent. of all infected animals died. No remedies were found of any avail, and to this day no successful curative agent has been discovered.

It may be remarked that the number of outbreaks among cattle owned by natives was small, compared with those among European stock.

During the years 1904 and 1905 the disease abated, probably by reason of the fact that most of the cattle on the infected roads and farms had succumbed. Since then the veterinary measures, based upon a more exact scientific knowledge, have been successful in limiting the disease to a few isolated outbreaks.

It is confidently believed that if stock-owners would understand and conscientiously adopt the methods recommended by the Veterinary Department, African Coast Fever would soon cease to exist in Southern Rhodesia.

Cause of the Disease.—African Coast Fever is essentially a disease of bovine animals, and is caused by a minute parasite (*Theileria parva*) which undergoes development partly in the tick and partly in the ox. Having been taken up by the tick from an infected animal, it undergoes sexual multiplication, giving rise to certain minute bodies which are inoculated by the tick into the animal it bites. These first establish themselves in certain organs, such as the lymphatic glands and spleen, where they invade the white blood-cells, in which they undergo non-sexual division, producing the so-called "Koch's bodies." These break up into a number of small parasites which invade the red corpuscles, with which they are taken up by the ticks feeding upon the ox at that time, and in certain species of ticks undergo further development. At the height of the disease in the ox, some 75 per cent. of the red corpuscles are invaded, but since there is little reduction in the number of the red cells, it is assumed that the parasite does not bring about their destruction, although it may obtain nourishment from them. It is also probable that the principal injury to the host is caused by the toxic materials produced by the parasite.

Although numerous parasites may be present in the blood, the disease cannot be transmitted from an infected to a susceptible animal by blood inoculation from one to the other. The reason is that the parasites in the blood are non-sexual forms, and incapable of undergoing further development in the ox. It is believed that if an animal recovers, the particular parasites in it die out, and it is on these grounds that the "salted" animal is assumed to be incapable of perpetuating the disease: this assumption is open to doubt.

Incubation and Course of the Disease.—From the time the tick introduces the parasite into a susceptible animal, an interval of from ten to twelve days elapses before the first manifestation of the disease, namely, a rise in temperature. About this time or shortly after, the so-called "Koch's bodies" can be detected in the glands and spleen. A further period of from three to eight days elapses before parasites appear in the blood, during which time the animal becomes visibly sick. The number of cells invaded by these parasites increases daily, and towards the end of the disease up to 75 per cent. may be involved. The average time from the day of infection until death is about thirty days.

The coloured diagram given, which may be taken as representing the usual course of the disease, may help to make this explanation clear. In it the uncoloured portion represents the first stage, when the disease cannot be detected by the microscope or by clinical observation; the blue portion is the second stage, when the temperature is elevated and "Koch's bodies" are present, but no parasites in the blood; the red portion represents the third stage, when parasites are present in the blood and can be taken up by ticks biting upon the animal. Thus the third stage is the period of danger.

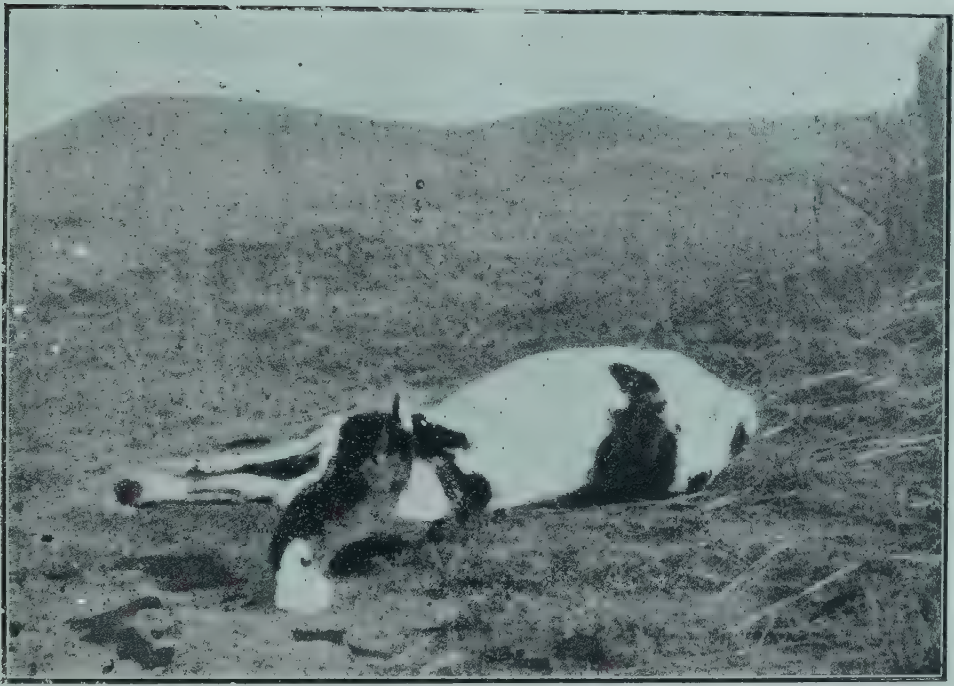
Although the chart is typical of the majority of cases and can be taken as a basis upon which to apply the preventive measures about to be described, cases running an unusual course are frequently met with. For example, in a herd under careful observation where the temperatures are regularly taken, cases are met with in which the temperature rises, but returns to normal after a few days. In these cases a relapse may occur after several weeks, and the animal may die or there may be no relapse and the animal may recover. Such cases have been more numerous since systematic dipping has been practised as a method of suppressing the disease. It has been shewn by experience that in animals habituated to arsenic by constant dipping, the infective processes are retarded and the average period of incubation may be extended to sixteen days, but it is now clear that it exerts other influences upon the course of the disease which cannot be fully explained.

Symptoms of the Disease.—(a) *Symptoms during Life.*—The first indication is a sudden rise of temperature, which may reach 107 degs. F.; but, notwithstanding the fever, outward indications are rarely met with before the last few days preceding death. These are not very distinctive, but the sick animal may evince one or more of the following symptoms:—Dulness; falling-in of the flanks; running from nose, eyes and mouth; a husky cough; swelling of the glands; weakness of the loins; staggering gait and a tendency to lag behind the herd; constipation, followed by diarrhœa; and there may be blood in the fæces. The tissues around the eyes may be swollen and the eyes appear sunken. Frequently the sick animal will continue to feed until the disease is advanced; finally, however, rumination ceases and appetite is lost. When the lungs are involved, the animal will grunt when walking downhill, and there may be distress in breathing.

(b) *Post-mortem Appearance.*—The most important lesions are:—Yellow discoloration of the fat; enlargement and congestion of the glands, especially of the throat and neck; alteration in the blood, indicated by small blood spots or hæmorrhages on the surface or lining of the heart, on the serous membrane and in the gall-sac and bladder.

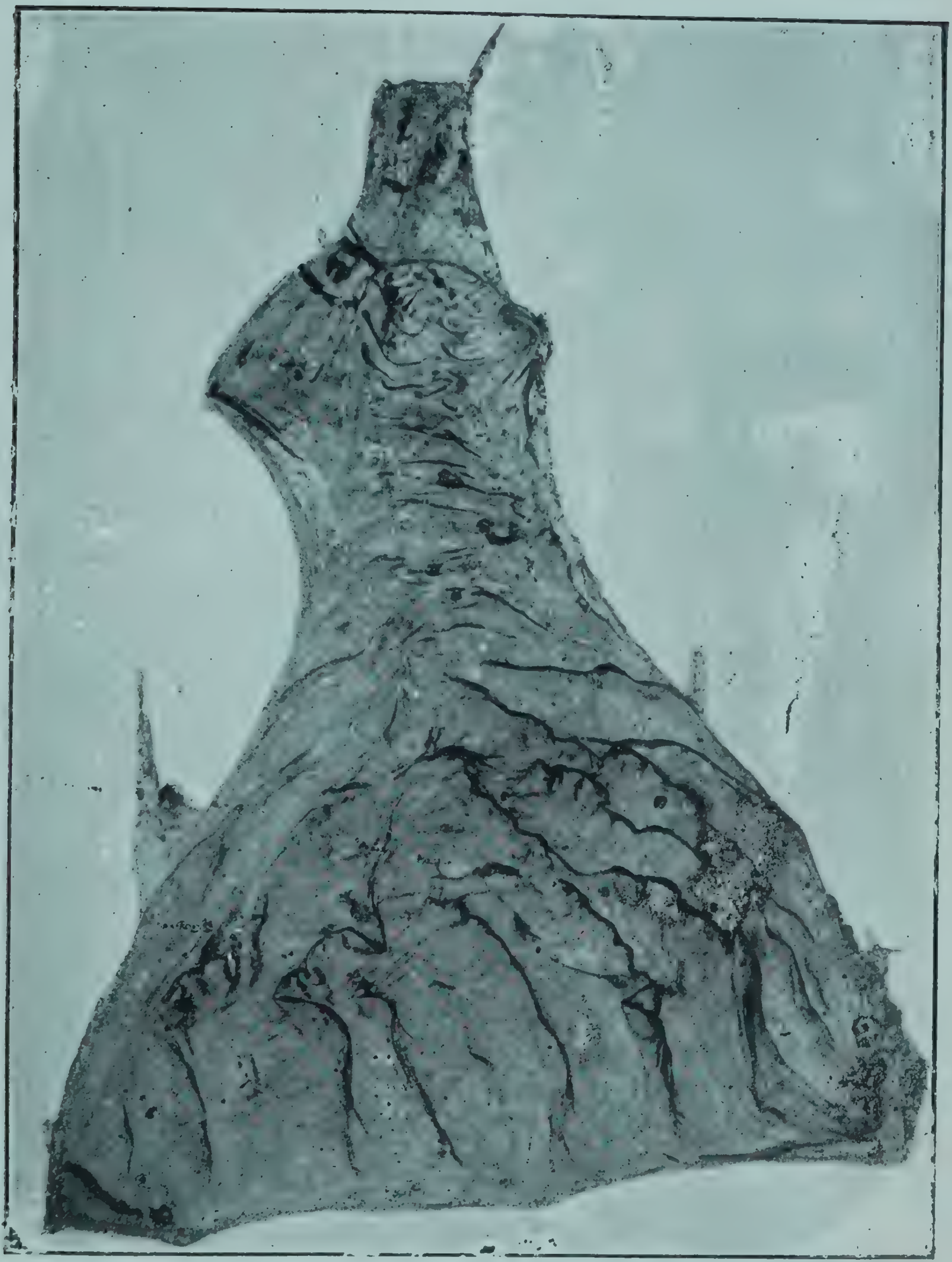
In a great many cases the lungs are affected, being dark in colour and infiltrated with straw-coloured fluid, which collects between the lobules or escapes into the chest cavity. This material in the air passages becomes whipped up into a foam, which passes up the windpipe and escapes by the nostrils, as in the photograph. The lining of the fourth stomach or abomasum is inflamed and frequently ulcerated; and blood spots are met with here and throughout the intestines. Small white, yellow or purple spots varying in size from a pin's head to a pea, known as infarcts, are seen as small elevations or depressions on the surface of the liver and kidneys. When cut into, they are generally triangular or conical in shape, the base being on the surface and the apex in the depth of the organ. These infarcts, when present, are almost diagnostic.

(c) *Microscopic Examination of Blood and Tissues.*—When by reason of the symptoms before or after death the animal is suspected of African Coast Fever, confirmation may be obtained by the microscopic examination of the blood and organs for the specific parasite. If the animal is dead, a small drop of blood should be placed upon a piece of flat clear glass and spread in the manner shewn in the drawing.



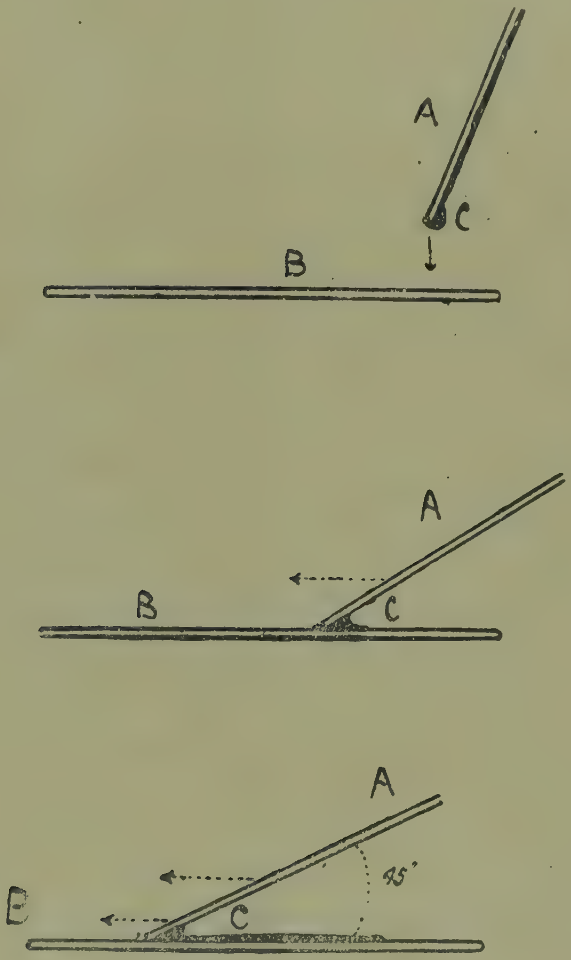
Photograph of an animal dead from African Coast Fever, shewing froth at the nostrils.

A dipping tank in use. In the systematic dipping of stock lies the solution of the African Coast Fever problem.



Photograph of the stomach (*abomasum*) of an animal which died from African Coast Fever, shewing characteristic ulcers.

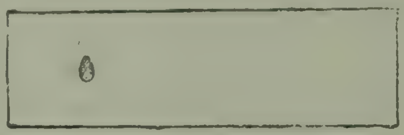
The film of blood should be so thin that it will rapidly dry in the sun, so that when viewed under the microscope the red cells may be seen deposited in the single layer and the parasite in them may be clearly distinguished. But, in order that the diagnosis may be more certain, in all cases a little of the spleen pulp should be spread thinly on a glass in order that search may be made for "Koch's bodies," which are diagnostic of the disease. If the animal is still alive, the hair from the edge of the ear should be clipped off and the ear washed and dried. The margin of the ear should be cut with a clean pair of scissors or knife, or one of the veins which are prominent just below the skin may be pricked with a needle. After a little blood has escaped, a drop should be collected on the glass and treated as described above.



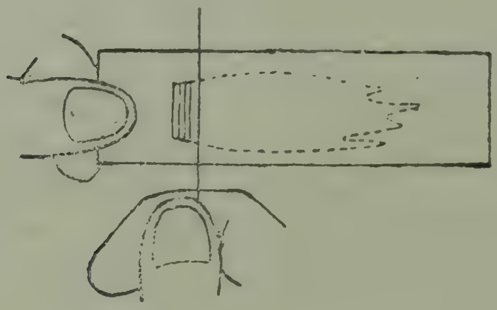
A first slide. B second slide. C drop of blood.

Method of preparing a blood smear.

Several labelled preparations should be sent from each case. The thinner the film, the better for examination. The glasses should be wrapped separately in soft paper, and should be packed carefully in a tin box and forwarded without delay, together with the fullest particulars concerning the case, to the office of the District Veterinary Surgeon. Duplicate preparations may also be despatched direct to the Government Veterinary Bacteriologist, Salisbury.



Drop of blood on glass



The same spread out into a thin film.

Another method of preparing a blood smear.

Transmission of the Disease.—African Coast Fever is not directly contagious; a sick animal will not infect another susceptible animal by contact or by the excretions or fluids of its body. The disease is only transmitted by the bite of certain species of ticks, namely: *Rhipicephalus appendiculatus*, or brown tick; *Rhipicephalus evertsi*, or red-legged tick; *Rhipicephalus simus*, or black-pitted tick; *Rhipicephalus capensis*, or Cape tick; *Rhipicephalus nitens*, or shiny brown tick. Of these, the brown tick is the chief offender, and methods of controlling the disease are principally based upon a knowledge of its habits.

There are four stages in the life cycle of ticks: (1) eggs; (2) larvæ or seed ticks; (3) nymphs; (4) adults or sexual ticks.

In the case of the brown tick, the adult female, having become engorged and fertilised, falls to the ground, where she finds a suitable place, such as the loose soil in kraals, and deposits some three to five thousand eggs. In from five weeks to five months—according to climatic conditions—the larvæ or "seed ticks" hatch out. These may remain unfed for several weeks until a suitable host is available, upon which they may remain attached for three to ten days. Having fed, they fall to the ground, and, moulting in about sixteen days, can remain alive unfed for several months, but will then attach and feed, remaining on the animal three to ten days. Having engorged, they fall to the ground, and in about eighteen days moult and are then ready to attach to a

Eggs laid by a single tick (considerably enlarged). Photograph by Mr. R. J. Stordy, Principal Veterinary Officer, British East Africa.

suitable host to feed as adults, although they may survive many months unfed. Having attached, they remain on the host from four to ten days, during which time they feed and copulate.

Although larvæ and nymphs readily attach during the cold weather, the adults are scarce on cattle during the winter. Unfed adults have been known to live 630 days under laboratory conditions, and in practice it has been found that a race of infected brown ticks on a farm from which bovine animals have been removed may survive as long as fourteen months, possibly longer, and still prove infective. While the brown tick requires three hosts upon which to feed in its different stages, the red-legged tick requires only two, since the larvæ crawl into the ears of their hosts, where they feed and moult and feed again as nymphs, remaining on the animal about fifteen days.

It is fortunate that the parasite of African Coast Fever does not pass through the egg stage, as is the case with the parasite of redwater. However, if a larval brown tick has engorged on an infected bovine animal having the parasite of African Coast Fever in its blood, it can infect a susceptible ox to which it attaches as a nymph; or, again, if a nymphal brown tick has fed on an infected animal, it can infect a susceptible ox to which it attaches as an adult.

African Coast Fever is peculiar to bovines, and the causal parasite cannot establish itself in any other species; so that ticks can only obtain the parasite from an infected bovine animal, and then only from one in the last stages of the disease, when the parasites are present in its blood. If, therefore, an infected tick bites and completes its feed upon a horse, sheep or other non-susceptible animal, the parasite is discharged without affecting the animal, and the tick thereafter becomes non-infective. But it has been found that infected ticks are still infective after feeding upon a rabbit for three days, if they complete their feed upon a susceptible animal within seventeen days.

Infected ticks may, however, be *carried* by other animals to which they do not attach—by human beings in their clothing, in hay or crops, in the hides (especially the ears) of dead animals—and may thus be transported many miles. Precautions must always be taken against such risks, although in practice the great majority of outbreaks are brought about by ticks which have fallen directly from an infected ox which has at some previous date passed over or died in the vicinity.

The foregoing details may be more easily understood from the diagram. They are of considerable importance, because upon them are based the principles for the control of the disease.

How to Determine the Source of an Outbreak.—The disease having broken out, it is generally necessary to determine whether the animals became infected on the farm, or picked up infected ticks from without. In coming to any conclusion, it should be borne in mind that:—

(a) If the sick animal has been on the farm for one month before death, it is practically certain that it contracted the disease on the farm.

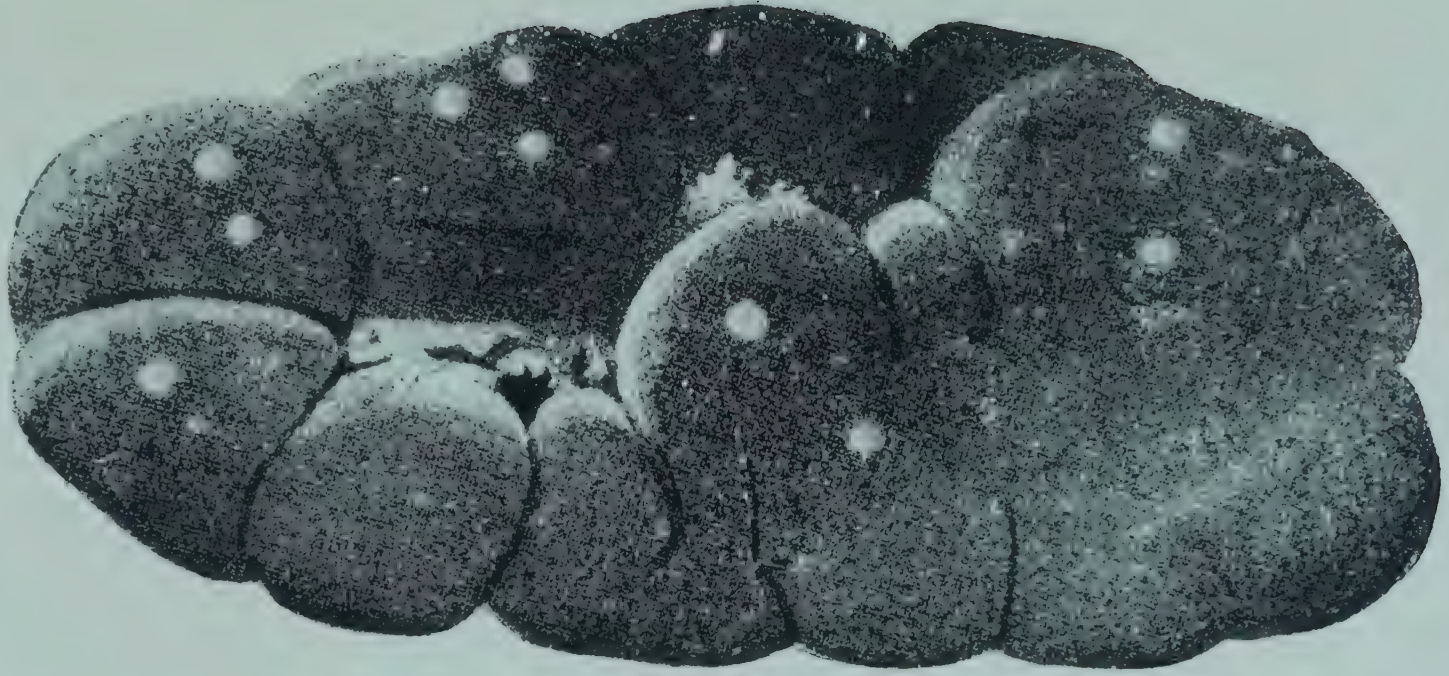
(b) If, however, the disease appears in animals which have not been on the property longer than a week, it is probable that it was contracted before they arrived; and in endeavouring to ascertain whether they became infected, it should be remembered that the disease may be in the system for about three weeks before visible symptoms are manifest, and that roughly one month elapses between the time of infection and the death of the animal.

(c) It frequently happens that the first case of a disease is overlooked, and that it is only diagnosed when quite a number of animals are affected at or about the same time—what is generally known as the "second crop" of cases.

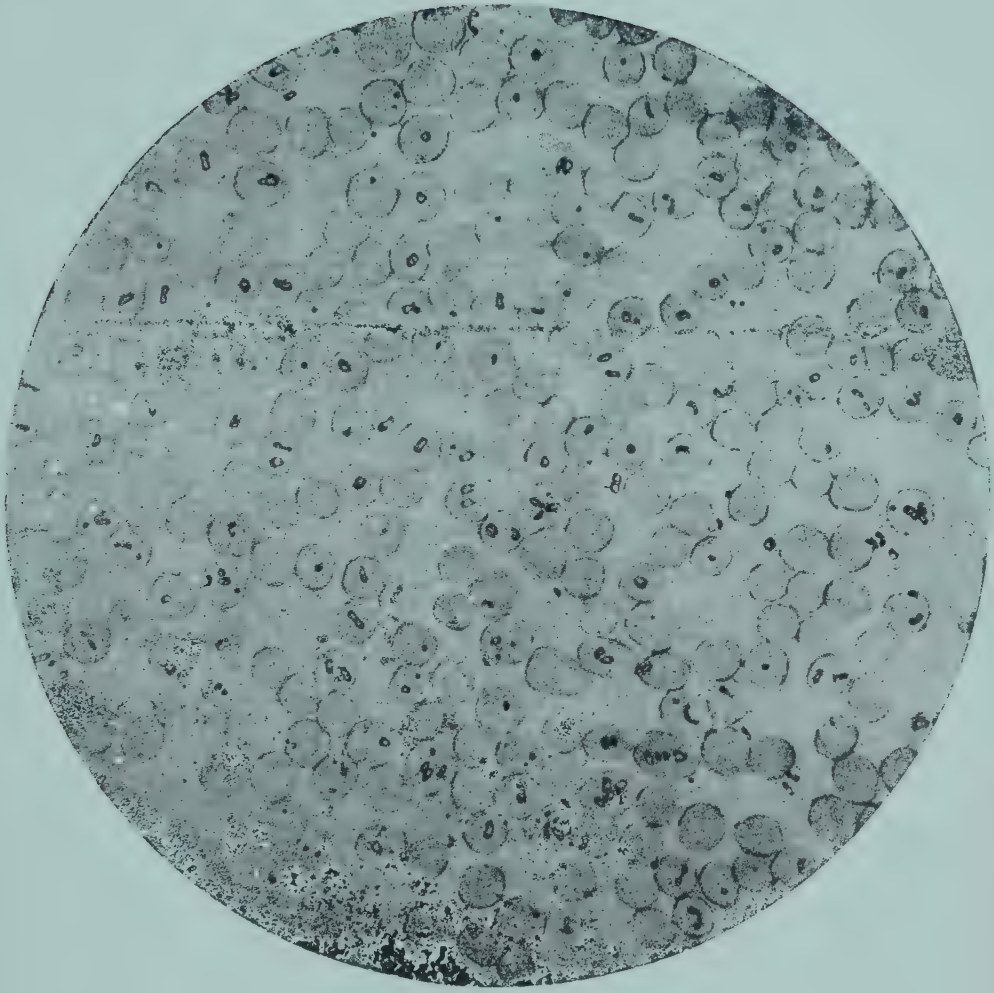
The first animal to contract the disease supplies, during the last week of its life, to those brown ticks feeding upon it, blood containing the parasite. The larval or nymphal ticks dropping during that week seek shelter, moult, and when the opportunity arises, re-attach. As explained, this process takes at least sixteen days and generally longer, although the nymphs and adults may survive unfed several months awaiting the arrival of a suitable host. In addition to this, the disease is not noticeable in the infected animal until the last stages of the disease, often about twenty-one days; so that the "second crop" of cases does not generally occur until at least six weeks after the first case. It may happen that, if many ticks survive, quite a considerable number of animals become sick about the same time; but one tick is sufficient to carry on infection, and laboratory experiments shew that an adult tick can survive *unfed* as long as twenty-one months. Therefore, the alarming and original theories so frequently advanced to explain outbreaks, where previous movements of cattle cannot be fully traced, are generally unnecessary.

Precautionary Measures.—1. *Short-interval Dipping.*—African Coast Fever is a disease which can be easily prevented by the simple expedient of *systematic dipping*. If introduced to a farm where short-interval dipping is practised, the disease cannot establish itself; and, when established on a farm, it can be quickly eliminated by the application of the process.

The term "systematic" or "short-interval" dipping implies the



Kidney from case of African Coast Fever, shewing the areas of necrosis (infarcts) in various stages. (From pamphlet by W. Robertson, M.R.C.V.S., issued by the Government of Cape of Good Hope.)



Micro-photograph of typical blood smear of African Coast Fever. (From "Journal of Comparative Pathology and Therapeutics.")

immersion of cattle and other domestic animals in solutions destructive to ticks and other parasites, at certain intervals based upon a knowledge of the life cycle and habits of these parasites.

In the case of African Coast Fever, the principal object to be attained is the destruction of the brown tick, and this presents certain difficulties because, as we have seen, this tick seeks different hosts in the larval, nymphal and adult stages, *and may escape from them in as short a time as three days.* Therefore, if it is to be caught, the dipping must be carried on at short intervals, and the dipping solution must be of such strength that the cattle can be immersed in it as frequently as every third day without being harmed by it. To obtain a dip thus harmless to cattle, and at the same time destructive to the tick, was a matter of considerable difficulty, but the problem was finally solved by Watkins-Pitchford, who, after numerous experiments, evolved the so-called "laboratory dip," which was made up of :—

5½ lbs. soft soap,
2 gallons paraffin,
8½ lbs. arsenite of soda (80 per cent. arsenic),
400 gallons water.

But when it was found that certain ticks could attach and escape within as short a period as seventy-two hours, the composition was modified to form what was known as the "three-day dip," viz. :—

3 lbs. soft soap,
1 gallon paraffin,
4 lbs. arsenite of soda (80 per cent. arsenic),
400 gallons water.

Since Watkins-Pitchford's discovery, several proprietary dips of a similar composition, and based upon the same principles, have been put on the market. Such dips must fulfil the requirements of the "Cattle Cleansing Ordinance of 1918," and must contain an approved and "effective tick-destroying agent" in specified quantities.

In addition to the actual in-contact effect upon the ticks, it is found that these solutions protect the animal for a short period by their repellent effect, and also by reason of the fact that a certain quantity of arsenic is absorbed through the skin and permeates its lower layers and becomes stored there; so that it is probable that the tick also becomes poisoned by the ingestion of arsenic.

Although, for the eradication of an established outbreak of African Coast Fever, three-day dipping is absolutely essential, and should be practised on farms menaced by the disease, in other circumstances it has been generally found more convenient to dip once a week, a certain day being recognised as "dipping day," the natives and cattle becoming used to it as a regular part of the farm routine. Where the ticks are controlled in this way, African Coast Fever can only gain a footing by the merest chance and should be promptly eliminated.

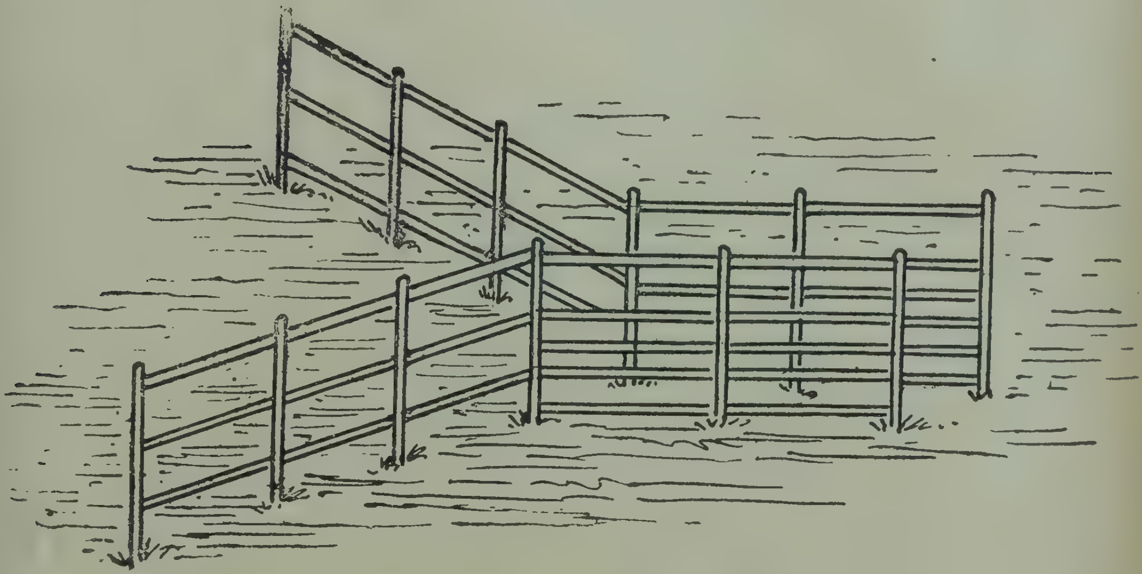
Dipping fluids should be frequently tested. In hot weather they are liable to become too strong, as the result of evaporation; in the wet weather too weak, as the result of flooding. A solution under strength is a serious danger, by giving rise to a sense of false security.

It is a habit of the brown tick and the red-legged tick to make their way into the ears and attach themselves to the eyelids, where they may remain protected from the dip, as animals which are accustomed to being dipped learn to avoid the complete immersion of the head. Ticks under the root of the tail often escape owing to some animals keeping the tail compressed when being dipped; others in the tuft of the tail are also protected by the matting of the hair. Therefore, if the best results are desired in combating African Coast Fever, these parts should receive special dressing in addition to the dipping, for it is most important that no infected tick shall escape. For this purpose a mixture made by dissolving six to eight paraffin wax candles in one quart of paraffin oil has been recommended.

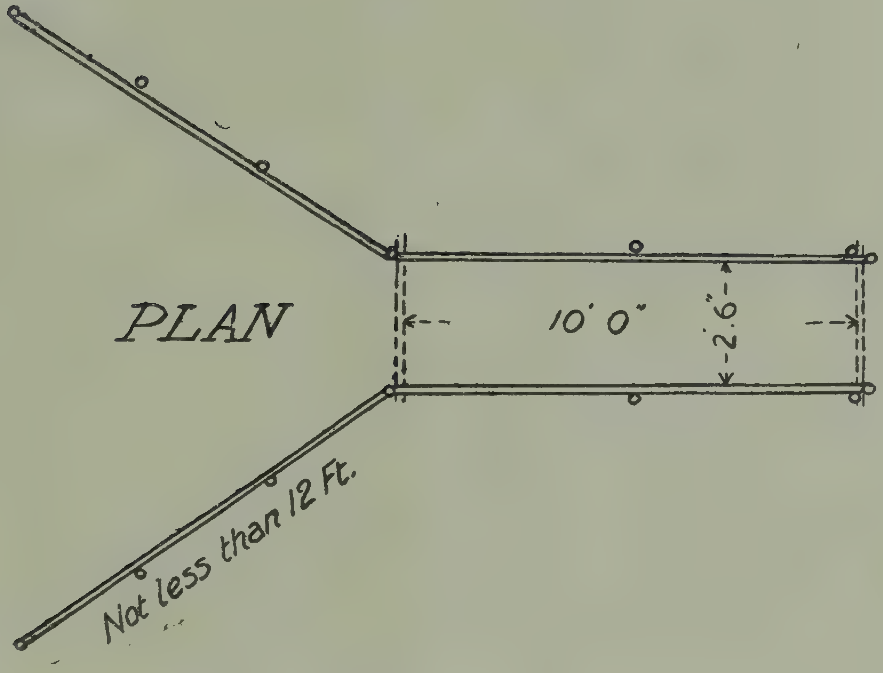
Both the blue and brown tick will attach themselves to equines, sheep, goats and other animals, but in so doing to a great extent lose their infectivity to cattle. Nevertheless, a farm on which ticks are few is better ensured against disease than where they are plentiful, and any system of dipping should, as far as possible, include all classes of stock on the farm. Again, it must be borne in mind that in various stages the ticks can remain for long periods on the ground without feeding, and any system of dipping must be carried out regularly and for a considerable period, to ensure that the crops of ticks are caught as they attach. A dipping campaign must, therefore, extend over a lengthy period.

By systematic dipping, *cattle and other animals act as tick traps*, collecting the ticks and conveying them to the dip to be destroyed; and, if the process is conscientiously carried out, the desired results are often achieved even more quickly than might be expected. In one of Watkins-Pitchford's experiments it was found that a badly infected area was cleansed of brown ticks in as short a period as three months. Apart from the protection afforded against African Coast Fever, the benefits to be derived from systematic dipping in eradicating redwater and allied diseases, and thus bringing about a general improvement in his stock, compensate the farmer for the trouble involved. The importance of regular dipping is no longer based upon theory, but has been abundantly proved by practical experience, in the light of which the stock-owner who fails to dip his animals must be regarded not only as a fool to his own interests, but a menace to his neighbours and an obstacle to the progress of the country.

2. *Temperature Camp System.*—In the days before *short-interval dipping* was introduced, African Coast Fever was often successfully dealt with on the *temperature-camp system.* This was based upon the knowledge that the infected animal shewed an elevated temperature for several days before the parasites made their way into the blood and the ox became a source of danger. That is to say, advantage was taken of the period of warning which in the chart is indicated by the blue colouring and is called the "second stage." For the success of the system it was necessary that there should be certain clean veld to which cattle could be shifted. This was divided into a small clean temporary camp (Camp No. 1) and a larger clean permanent camp (Camp No. 2).



Cattle crush and pen for taking temperatures.

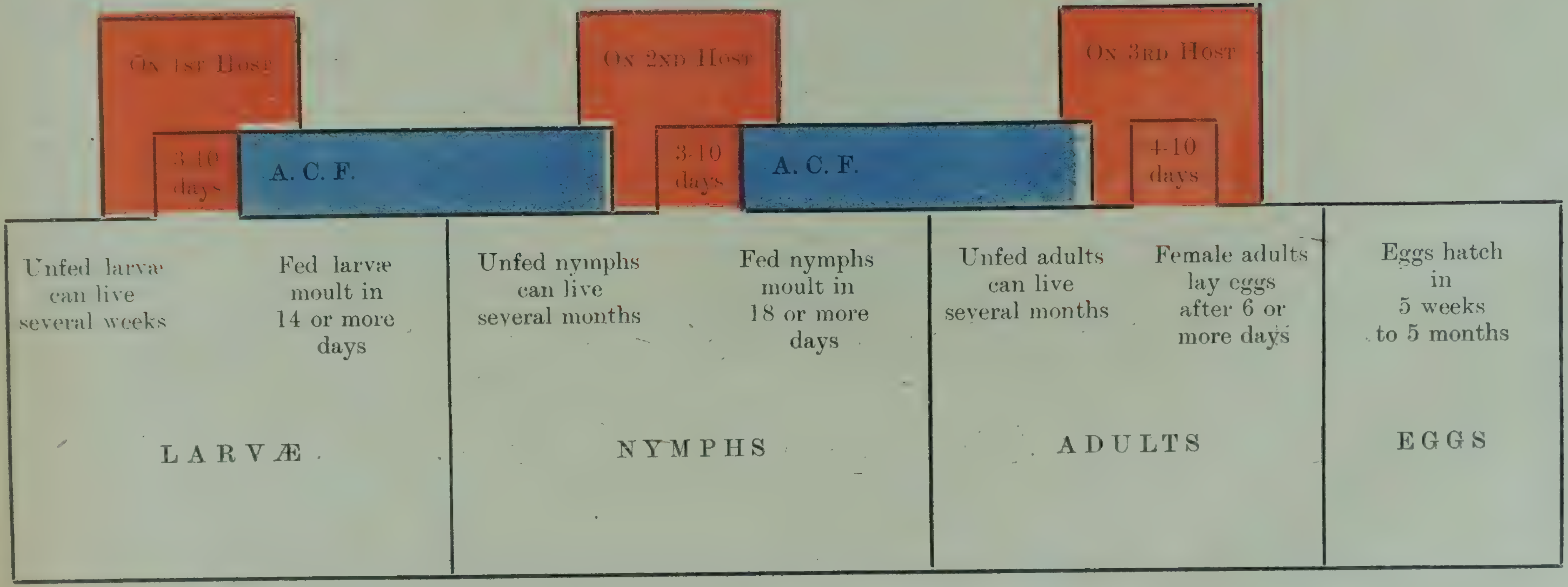


A crush-pen having been erected, the temperatures of all in-contact animals were taken daily. Those shewing an abnormally high temperature were marked, and if this continued for a second day, were isolated or destroyed. With oxen and animals of average size and breeding, an early morning temperature of 103 degs. F. was regarded as suspicious. With calves and highly bred or nervous animals, a temperature a little above this average was to be expected, and a certain amount of discretion had to be exercised in interpreting the readings. It was rather upon a sequence of high temperatures than a single elevation that animals were condemned, and, when possible, the temperature reading was controlled by microscopic examination of gland smears in which, in infected animals, "Koch's bodies" could be detected before the animals became a source of infection. Infected animals having been detected and disposed of, all in-contact animals were carefully sprayed and were moved on to Camp No. 1, and were there temperatured daily for at least three weeks. If during that time any suspicious rise of temperature persisted for two or more days, they were destroyed or sent back to infected veld. Those animals which registered a normal temperature throughout the three weeks were again carefully sprayed and passed on to the second camp, where they remained unless a further case occurred, which indicated that Camp No. 2 was not clean veld; in which case the process had to be gone through again, and the cattle were once more moved on through temperature camps to new grazing thought to be clean.

The foregoing method is even now resorted to in dealing with an outbreak where dipping tanks are not available, and is generally combined with short-interval dipping when dealing with serious outbreaks, the extent of which is not understood. The closer settlement of the land, however, has generally limited the areas to which in-contact cattle can be removed. With this system, infected pastures had to remain free from cattle for a minimum period of fifteen months to allow the infected race of ticks to die out, whereas with the short-interval dipping, by the collection and destruction of ticks, the veld becomes cleaned in a far shorter time. The latter system, therefore, is quicker and far more satisfactory and has generally replaced the temperature-camp system. The ideal method is a combination of the two. Every effort should be made to eliminate the disease at the start. The most drastic measures applied at the commencement of an outbreak will prove the cheapest in the end.

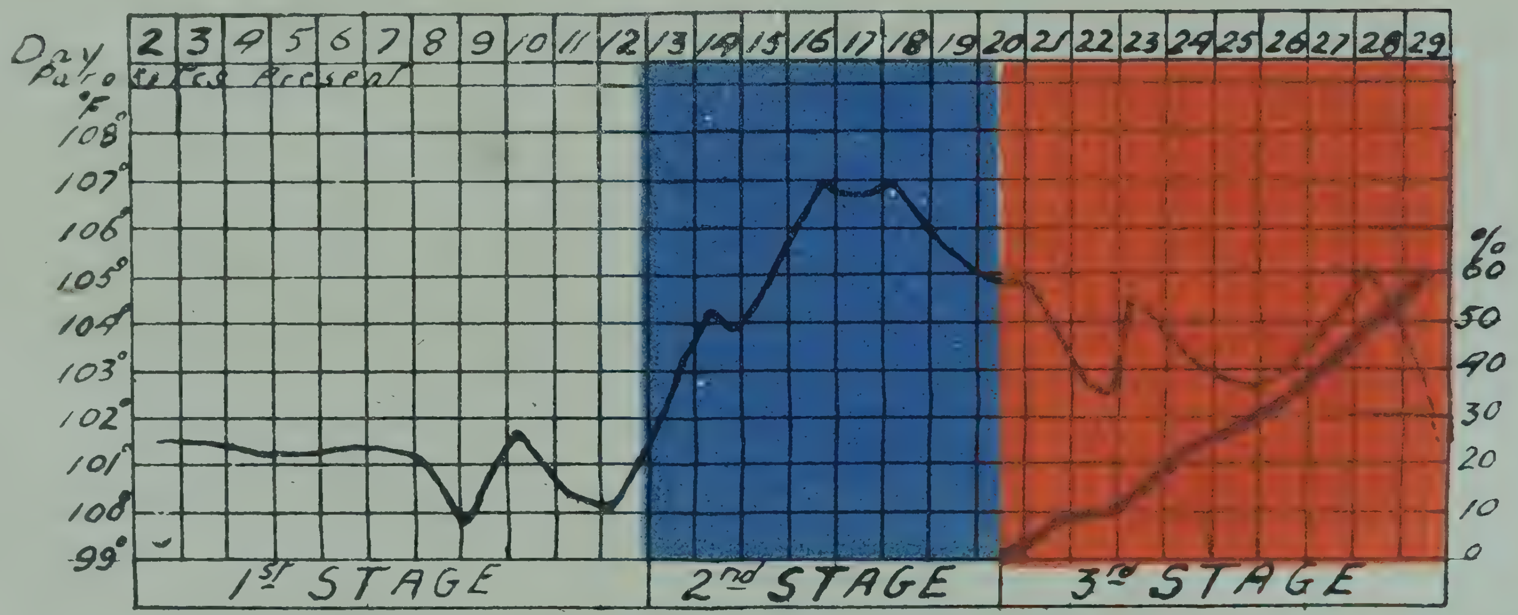
General Precautions.—When it is remembered that fully 95 per cent. of animals affected with African Coast Fever do not recover, and that up to the present no successful method of treatment has been discovered, and when the losses and inconvenience to the community are considered, it should not be necessary to urge every stock-owner to take the fullest precautions against this disease. As previously pointed out, it is of the greatest importance to detect the first case, and thus prevent the "second crop" of cases which will follow from it if preventive measures are not promptly adopted. Therefore, even in districts thought to be free from the disease, the cattle-owner should always be on his guard and should observe every sick animal and notify to the Veterinary Department any case of an unusual character coming to his notice. Such

THE BROWN TICK *(Rhipicephalus appendiculatus).*



On 1st Host
3-10 days
A. C. F.
On 2nd Host
3-10 days
A. C. F.
On 3rd Host
4-10 days
Unfed larvæ can live several weeks
Fed larvæ moult in 14 or more days
LARVÆ
Unfed nymphs can live several months
Fed nymphs moult in 18 or more days
NYMPHS
Unfed adults can live several months
Female adults lay eggs after 6 or more days
ADULTS
Eggs hatch in 5 weeks to 5 months
EGGS

CHARACTERISTIC CHART OF AFRICAN COAST FEVER.



The Chart shews the body temperature of a cow infected in England by ticks sent from South Africa.

The thin black line indicates the temperature record.

The rise in the percentage of infected red-blood-cells is indicated by the heavy black line.

Stage 1.—The period of incubation.

Stage 2.—The period when the temperature is elevated, but parasites are not present in the blood. "Koch's bodies" may be found in the spleen and glands.

Stage 3.—The period when the parasites are present in the peripheral blood.

precautions are, of course, all the more necessary in districts where the disease is known to exist.

In reporting cases to the Veterinary Department, the following particulars should be given :—

1. Age, sex, colour and breed of animal.
2. Where sick. How long in present locality, Place from whence animal came.
3. How long sick, and when death occurred.
4. Symptoms: Temperature; breathing; state of coat; appetite; urine and fæces; any unusual conditions.
5. *Post-mortem* condition of blood; glands of throat; wind-pipe; lungs; heart; liver; stomach; kidneys; bladder; any unusual conditions.

   In describing size and colour, compare with some well-known object.
6. Temperature of animal at time when smears were taken, and part of dead animal from which smears were taken.
7. Number of animals on the farm. How many sick or dead to date.
8. Treatment and preventive measures adopted.

Smears should be taken in the manner previously described, and should be submitted with the report.

Stray cattle, travelling oxen and all cattle newly arrived on a farm are the principal sources of danger, and should not be allowed to mix with other cattle on the farm until twenty-one days after arrival. They should be dipped or sprayed on arrival, and again before being allowed to mix with the herd. Cattle should not be allowed to graze over the whole of a farm, but certain areas should be kept free from cattle, one portion being large enough to carry the whole herd indefinitely, should necessity arise. In order that this reserve area be not too great a handicap on the grazing capacity of the farm, it should be supplemented with a haystack. A crush-pen should be erected on all farms in order that cattle may be more easily handled and temperatured, sprayed or treated as expeditiously as possible.

Stock-owners should provide themselves with clinical thermometers, glasses for preparation of blood smears, bottles for the forwarding of spleen, spray pumps, and a quantity of dipping material, and should learn how to use them. Every farm should be provided with one or more dipping tanks. The benefits to be derived from short-interval dipping cannot be too strongly insisted upon. The stock-owner who regularly and systematically dips his stock has little or nothing to fear from African Coast Fever and other tick-borne diseases, which in the past have so seriously handicapped the pastoral industry in this country.

Further Experiments with Poisoned Bait on Maize Lands.

By R. W. Jack, F.E.S., Agricultural Entomologist.

During December, 1919, further tests were carried out on a fairly extensive scale with a view to demonstrating the value of poisoned bait applied to red soil in connection with maize culture. These experiments were not as exhaustive as intended, owing to the notoriously abnormal season in respect to the incidence of rain, planting being very irregular and in general much later than usual. Mr. R. L. Thompson, Assistant Entomologist, spent the whole month in the Mazoe district for the purpose of carrying out this work (*inter alia*), and at the same time other experiments were conducted near Salisbury.

The insect pests involved in these experiments consisted of Surface Beetles (*Gonocephalum* and *Emyon.*, fam. *Tenebrionidæ*), Snout Beetles (*Tanymecus* and *Systates*, fam. *Curculionidæ*), Crickets and Grasshoppers. The bait used was either "Champion" brand arsenic and molasses solution, or arsenite of soda (60 per cent.) 1 lb., brown sugar 8 lbs., water 10 gallons. The experiments were designed to shew, besides the efficacy of the bait under various conditions, the best and most economical carrier in the form of chopped grass, Napier fodder or other green stuff. In addition it was thought that improvements on the original method of application might possibly be discovered and further practical experience of value gained in respect to the operations.

Surface beetles appeared to be less abundant this season than usual, but one species of Snout Beetle, namely *Tanymecus*, was very much in evidence and did a great deal of damage.

The *Mazoe experiments* may be divided as being directed (1) against Snout Beetles (*Tanymecus*) and (2) against Surface Beetles (*Gonocephalum*).

1. **Snout Beetles (Tanymecus).**—In these experiments land which already bore plants attacked by the pest was treated, and also land on which the plants were not yet above ground, the beetles in the latter case being found feeding on Rapoku grass (*Eleusine* sp.) on the headlands and on the land, but particularly on the headlands, and on volunteer maize. "Champion" brand was used, the carrier being chopped Napier fodder and a succulent grass. The bait was distributed on 1st December very heavily, 20 gallons of the solution covering only 17 acres. Five boys covered this area in two and a half hours.

Block I. consisted of 10 acres, bearing plants with 5 to 8 leaves. Thirty-two per cent. of the plants (the stand was very poor) were attacked by the beetles, one to three being found to each plant. It may be noted that possibly a far greater number of the beetles were present, as *Tanymecus* has the habit, with which we were not familiar at the time, of hiding mainly under clods in the vicinity of the plants attacked, only a small proportion remaining on the plants themselves during the day-time.

Block II. consisted of two acres next to Block I., and had been planted, but the maize was not yet above ground.

Block III. consisted of three acres next to Block II., and was unplanted.

Block IV. consisted of one acre heavily infested with the beetles along the headlands and in the land itself. It was treated with chopped Vaalbosch dipped in the solution.

Block V. also consisted of one acre, and was baited along the headlands where the beetles were particularly abundant on rapoku grass, chopped grass dipped in the solution being employed.

On 2nd December the number of pests throughout was apparently unaltered.

On 3rd December examination of 100 of the worst infested plants on Block I. shewed one dead beetle and only 21 living. A similar reduction appeared on Blocks II. and III. Block IV. was thoroughly examined in respect to the headlands, and in 10 yards only seven apparently healthy beetles, one dead beetle and one dead field cricket were seen. Twenty stools of rapoku grass just inside the ploughed lands, which had been swarming, produced seven living beetles only. Block V. produced five living beetles only from 50 stools of rapoku grass and some volunteer maize plants in the lands, and the worst infested grass in the headlands produced only eight living beetles and one dead.

On 4th December Block I. gave 22 living beetles from 100 badly-eaten plants.

On 27th December Blocks I. and II. had been replanted and the plants were 5 to 7 inches high. On Block I. only one or two beetles could be found, and there was no trace of insect injury to the second planting. Blocks IV. and V. shewed slight injury (these lands had possibly been re-invaded), but on 10 acres of untreated land adjacent the beetles were extremely numerous, and had already done so much injury that a 50 per cent. loss was to be expected, and the owner had already decided to replant, after baiting this area. This land as well as Blocks IV. and V. was planted about the end of the first week in December.

Mr. Thompson adds the following notes:—

1. The experiment can only be regarded as most successful.

2. Poisoned bait seems particularly valuable against *Tanymecus*, since the beetles appear and the farmer can bait before the first heavy rains and the rush of the planting season commences.

3. A heavier application may be given to rapoku grass in the headlands and any grasses or volunteer maize in the lands, but the bait should also be carried over the whole of the bare lands.

4. As carriers of the bait, Napier fodder or coarse grasses are to be preferred to finer grasses, since the latter absorb more bait and do not broadcast so easily. Vaalbosch is not recommended.

5. Very few dead adults were found, but of 50 adults killed and placed on the lands on 3rd December, only two remained on the following day, and of these one was being removed by ants.

2. **Surface Beetles (Gonocephalum).**—The dry spell in December was judged to have delayed the emergence of these beetles. On 9th December 1.25 inches of rain fell, and on 10th December there was 100 per cent. increase of the beetles in the lands. Bait was distributed that afternoon, but was washed off by rain later. The afternoon of the 12th chopped Napier fodder dipped in "Champion" solution was distributed, 25 acres being covered with nine sacks of bait, eight boys covering this area in 1 hour 50 minutes. Heavy rains fell 14th and 15th December. On 15th December the beetles shewed reduction in numbers, but sufficient remained to prove injurious to the crop under favourable conditions. On 16th December several hundred dead beetles were found and a 70 per cent. reduction in number. These 25 acres were rebaited on 16th and 17th December, and on 17th December many more dead beetles were found. On 27th December only a few beetles could be found on this land, and 95 per cent. of healthy plants testified to the efficiency of the treatment. N.B.—This land was stated by the owner to have suffered severely last year from surface beetles, an extremely poor stand being secured. The beetles were present in large numbers on adjacent untreated lands.

Two experiments carried out at Salisbury were as follows:—

(1) A 14-acre piece of red ground which had been under maize last year bore on 4th December a considerable number of volunteer plants, germinated by the October rains, and many weeds. This maize was heavily infested with *Tanymecus* and a few *Systates*. Field crickets and grasshoppers were common, but surface beetles rather scarce. This was baited, unduly heavily, with chopped, rather dry, grass dipped in "Champion" solution. The dry grass soaked up the liquid heavily, and was awkward to distribute. One gallon only wetted one sack of grass, and this only covered one acre. Examination of the ground two days later failed to reveal any dead snout beetles, but two dead field crickets and a few dead surface beetles were seen. The writer was indisposed for the fortnight following this inspection, and in the meantime the land was cleaned up by natives with hoes. It was planted on 10th December, and no insect injury of any description could be found on the ensuing crop. It is in any case quite certain that no snout beetle injury occurred, as the crop was examined carefully and the damage where present is conspicuous.

(2) An adjacent piece of ground was in a similar condition, and it occurred to the writer that the presence of volunteer maize and weeds might be utilised to dispense with the usual carrier for the bait. Con-

sequently on 9th December the area was treated with a solution of arsenite of soda (60 per cent.) 1 lb., brown sugar 8 lbs., water 10 gallons, the liquid being sprayed broadcast from a knapsack pump fitted with a Bordeaux nozzle, set at rather a long angle. The operator simply walked rapidly forward waving the nozzle from side to side so that a few drops fell on all the plants and weeds passed over. It was found that apart from the time occupied in refilling the tank, about five acres per hour could be covered by an energetic operator, although few natives would attain this speed. On 12th December an assistant collected all living and dead snout beetles indiscriminately on this block, with the result that 73 per cent. were found to be dead and some of the remainder obviously poisoned; although it was judged that about 80 per cent. at least must have succumbed. A large proportion of the surface beetles were also killed and some dead grasshoppers and crickets were found. This block was planted on 12th and 13th December, and although a small amount of snout beetle feeding was apparent the damage was altogether negligible, notwithstanding the long dry spell after Christmas, which certainly checked the plants appreciably. The actual cost of material in this treatment, notwithstanding the fact that 5d. per lb. was paid for the sugar, was 8d. per acre. Neighbouring lands suffered so severely from the beetles that they had to be replanted, but it must be stated that they had been planted in the first place rather earlier (about 1st December) than the lands under experiment.

The success of this second experiment led to a test being made in the laboratory with a view to finding if a poisoned bait containing a compound of arsenic not injurious to vegetation would poison the beetles. A bait was made up containing Fergusson's arsenate of lead (paste) 1 lb., brown sugar 8 lbs., water 10 gallons. Growing maize plants in pots were infested with *Tanymecus*, and a few drops of the poison placed on the leaves, controls of course being kept. The results were surprisingly rapid, the bulk of the beetles in the treated pots being dead within two days. The experiment was repeated several times with the same results.

By this time material was not available for a field experiment, but rows of maize were sprayed heavily and repeatedly with the poison without injury, and next season this method of dealing with an infested crop will, if circumstances permit, receive a thorough test.

Although the results of the foregoing experiments are uniformly favourable to the use of poisoned bait in one form or another against certain maize pests, they are not regarded as conclusive in respect to the value of distributing the bait on chopped grass, etc., on lands bearing a growing crop already infested with snout beetles. The apparent results obtained in this connection both at Mazoe and Salisbury surprised the writer considerably, and it is felt that further tests are needed. The value of the distributed bait on bare lands is, however, unquestionable, as also is the value of spraying the bait on volunteer maize and weeds before these are hoed out previous to planting.

A useful practice when the season permits would undoubtedly be to run a few rows of maize here and there through the lands it is intended to plant later. If sufficient moisture falls to germinate the seed the snout beetles, etc., present on the plants will concentrate on the growing maize and may be destroyed by spraying these with arsenite of soda and molasses, a cheap and easy undertaking. This poison must, of course, not be used on growing plants it is desired not to injure. If no rain sufficient to germinate the seed fall before planting time, the bait should be distributed in the usual way on chopped Napier fodder, grass or other available green stuff.

Examination of the surroundings of land to ascertain whether snout beetles and other pests are abundant on the native grasses would also well repay the trouble involved. If present, the edges of the field should be sprayed lightly with the poison, always bearing in mind the deadly nature of the liquid and its attractiveness to stock.

Experience has taught the writer that farmers generally are much more likely to be impressed by a cure than by a preventive measure, and no doubt many maize growers will be inclined rather to await the tests with arsenate of lead and molasses, which can be applied to the infested crop itself, than to utilise the information already gained concerning the planting of trap rows and the distribution of bait over the bare lands. This, however, would be a false policy, because by the time a crop is obviously infested with snout beetles and the plants are big enough for the spraying, much irreparable damage will already have been done to the plants by the snout beetles themselves, quite apart from injury by surface beetles, crickets and grasshoppers to both seed and germinating plants. Let the farmer therefore look ahead and take steps *in advance* to protect his maize crop from insect attack.

It is obviously necessary to study the methods of cultivating any particular crop rather in relation to its insect enemies as a whole than in relation to one in particular, otherwise in recommending a particular practice to avoid one pest one might be encouraging another, as for instance in planting early to avoid cutworms there is a great risk of suffering heavy loss from maize stalk borer. Let us consider therefore how the practice of planting trap rows of maize to collect snout beetles, etc., where they can be easily destroyed, would fit in with improved practice and our own recommendations in regard to avoiding borer attack. It has been proved by observations year after year at Salisbury that plantings from mid-November to about the 27th of the month are the most liable to suffer heavily from borer,* and the writer strongly recommends that where practicable no maize should be planted before 1st December, and that every effort should be made to get all the seed in between that date and Christmas at the latest. It is admitted, however, that the season may be slightly earlier in the Mazoe valley and other localities with a warmer climate than Salisbury, although this is by no means proved. Sufficient rain usually falls in October or November to germinate maize seed in the soil, so that in a more or less normal year the procedure recommended is undoubtedly practicable. The farmer may, however, feel that, having a large acreage to cover, he cannot possibly rely on getting the work done in three weeks or so, especially as all the weather in December may not be suitable for planting, and that he must therefore start planting as soon as the ground is moist enough. It must be stated, however, that several large maize growers known to the writer not only admit the value of December planting, but make a rule not to start planting earlier and benefit accordingly.

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*The wording of this statement should be noted. Such plantings do not necessarily suffer heavily, but are very liable to do so in seasons when the pest is abundant and in localities where it is prevalent.

The solution of the difficulty lies simply in a sufficiency of planters to cover the ground in a short period. If sufficient planters are available to complete the work in, say, a fortnight to three weeks, there would appear to be no risk in waiting till December to commence operations, whether good rains fall in November or not. If they do not, and the season is consequently late, the farmer with a full quota of planters is obviously in a much better position than one who is short. In any event if there is a sufficiently prolonged dry spell in December to inhibit planting seriously, the November plantings are likely to be of little value. Even at the present price of planters it is far cheaper to lay in an extra one or two than to lose even a small percentage of an extensive crop from borer and other insects, not to speak of inability to take full advantage of the best planting weather, and the average annual loss from insect pests on the red soils is undoubtedly high.

In making these recommendations the writer, of course, cannot take labour difficulties into consideration. If enough labour is not available to work a full stock of planters simultaneously, the farmer must of course "cut his coat according to the cloth"; but under such circumstances it would appear to be the best policy to cultivate less land and to farm it more thoroughly, and good farming must include measures to check loss from insect pests. It is obviously far more economical, provided the cost of the means adopted is small, to increase the yield per acre than to cultivate more ground to obtain a similar increase in the total yield. More intensive methods of growing maize are admittedly unavoidable if progress is to be maintained, and the present heavy annual losses from insect attack must be substantially reduced if intensive methods are to pay as they should. Consideration of the value of these measures is therefore recommended to all progressive maize growers.

The plan as it stands at present involves:—

(1) A sufficient supply of planters to cover the land under cultivation in a fortnight to three weeks; say one to every 100 acres.

(2) A small supply of knapsack pumps fitted with Bordeaux nozzles; say one to every 150 acres of red soil.

(3) Receptacles, water carrier and chaff cutter as may be necessary for the preparation of poisoned bait, in accordance with previous recommendations.

(4) Napier fodder or other suitable carrier in sufficient quantity to ensure a supply of green stuff by the last week in November.

(5) The avoidance of planting before 1st December.

(6) If volunteer maize is not abundant on the lands, a few rows

of seed, say two rows to each fifty yards run here and there through the lands in October or beginning of November.

(7) Examination of these plants when up, as well as any weeds or grass on the lands or on the edges for leaf-eating beetles, grasshoppers, etc., under the clods and refuse or similar cover for surface beetles and crickets.

(8) If any of these pests are at all abundant, sprinkling of the maize as well as the weeds and grass on the lands or on its margin lightly with poisoned bait, consisting of arsenite of soda 1 lb., treacle sugar 8 lbs. or molasses 1½ gallons and water 10 gallons.

(9) If no rains sufficient to induce plant growth occur early enough the distribution of chopped Napier fodder, coarse green grass or other suitable carrier dipped in the poison shortly before or immediately after planting.

In conclusion, too much stress cannot be laid on the danger to stock involved in *careless handling* of the sweetened arsenic solution. With ordinary care the operations can be carried out without any risk whatsoever, but care is necessary. The molasses or sugar causes the solution to be particularly attractive to stock, and if a sufficient quantity is left exposed serious loss may follow. The danger lies particularly in (1) soil saturated with the liquid where chopped green stuff has been dipped ready for broadcasting; (2) leakage from vessels containing the liquid; (3) unnecessarily heavy spraying of herbage. The dipping and filling operations should if possible be carried out in a situation inaccessible to stock. Failing this, the saturated soil may be removed and buried (this is the writer's practice); at the very least the saturated surface should carefully be turned under. Vessels containing the poison should be kept in a locked store room away from meal, grain or any other foodstuff. When herbage, volunteer maize, etc., is sprayed the liquid should be scattered very lightly—only a few drops are necessary on each plant. Stock should be kept away from the vicinity immediately after spraying. A good shower of rain, of course, removes all danger.

Show Dates.

Bulawayo—25th and 26th May.
Victoria—28th and 29th May.
Umtali—25th and 26th June.
Salisbury—11th, 12th and 13th August.

Why Grow Trees?

By J. S. Henkel, Forest Officer.

Forestry is primarily a commercial enterprise, and has for its object the production of timber, mine props, fuel, bark or other forest products, for which there is a local or world-wide demand.

In most countries where climatic conditions are favourable, indigenous trees are found. Many of these are valuable for one or other purpose; others, though fulfilling useful purposes, produce timber of inferior quality. In any forest policy a basic principle is to utilise as intensively as possible nature's bountiful supplies, and to replace what is taken, so that there is no shortage. In territory taken up by Europeans during the past one hundred years or more, scant attention has been paid to any principle of conserving natural resources. Occupation of new territory has usually been characterised by scandalous waste of forest products. The mistakes of former generations are having their effects in our generation, and to-day, in all civilised countries, diminishing resources compel attention to principles of conservation.

Indigenous forests in sub-tropical and tropical countries usually consist of an assembly of trees and shrubs representing many orders, genera and species, and have intimate ecological relationships varying with climatic and soil conditions.

Where the population is sparse, usually only a limited number of species are utilised, but it often happens that a far greater number are deliberately destroyed by various methods of shifting cultivation. Where forests are of limited extent the utilisation of only a few species may lead to their extinction, unless they possess the power of reproducing themselves by means of coppice shoots or root suckers. It is a matter of common observation that less valuable species have greater powers of reproducing themselves and take possession of sites which should be occupied by representatives of the species removed. Thus it is not uncommon to find that after the removal of the utilisable timber the forest soil is occupied by scrub of little value. Such areas offer problems difficult to solve. The cost of eradicating or suppressing the scrub and fostering the seedlings and saplings of the better species, which not infrequently are of slow growth, is in many cases prohibitive. The difficulty of securing adequate natural regeneration is enhanced by the fact that the major quantity of seed is parasitised by insects, and were it not for this it is probable that throughout Southern Africa the better timber-producing trees would be more abundantly represented. Each forest locality requires to be independently investigated and dealt with on its merits. In localities where the forest growth is of inferior quality it may be that the introduction of fast-growing exotic trees planted at a wide espacement is the most economical and profitable course to adopt. Every reasonable effort, however, compatible with ordinary economic laws should be made to foster such indigenous trees of commercial value which through long periods of time have been adapted to the vicissitudes of the climate.

In forestry practice, as in agriculture and horticulture, the end desired is to secure the best products upon given types of soil and under special climatic conditions. To this end the world is searched for trees of commercial value capable of being grown under the conditions obtaining. Experiment therefore becomes a necessity, for it is impossible to postulate that trees in climates approximately similar would for that reason grow and produce timber of value when interchanged. Trees take many years to mature, and consequently much patient waiting must perforce be indulged in before definite pronouncements can be made. It is often the case that negative results are obtained, but when the result is positive it is often so valuable that the cost of experiments is infinitesimal in comparison.

In forestry many valuable results have been obtained in almost every part of the Empire. Take for instance the black wattle (*Acacia decurrens*, var. *mollis*) industry in Natal. Here is a case of a tree considered a forest weed in Australian eucalyptus forests, yet in the suitable climatic conditions obtaining in that province has been a great source of wealth, not only from the tannin produced by the bark, but also from the timber so extensively used as mine props, poles, building material, fuel and boxes for various purposes.

The common European white poplar (*Populus alba*), widely distributed over the farms of the Cape Province, came into its own during the great war, and has been almost the sole source of supply for splints in the manufacture of matches. Were it not for the abundance of this timber it is probable that the homely match would have been a luxury only the wealthy could afford. Besides being useful for matches, the timber is extensively used for fruit boxes.

The Cape Peninsula, when Europeans first formed a permanent settlement, possessed but a few patches of indigenous forest, confined more or less to inaccessible mountain kloofs. To-day a remarkable change is observed in the whole character of the scenery. Where at one time a proteaceous scrub mixed with various restionaceous species occupied the soil, extensive and beautiful forests of oak, pine, poplar and other trees are met with, which not only afford pleasure to the eye, but produce valuable timber as well. From some of the Government forests of exotic trees, revenues are being obtained which the most sanguine forest officer never even imagined. In the case of some *Pinus insignis* (a native of California), individual trees within a period of 33 years have reached a height of 140 feet, with a diameter at breast height of 3 feet. The remarkable thing about this pine is that it grows three times faster than in its own habitat. Some of the best stands recently sold by public tender realised a little less than £1,000 per acre. Even if only one-fifth of the price paid was received, a handsome profit is made.

Year by year the forests of exotic trees in the Union are producing an increasing revenue. From insignificant beginnings the Cape Forest Department had the honour last year of figuring as a revenue-producing department in the Finance Minister's budget speech.

What has been accomplished in the Cape Province and is now being extended throughout the Union can have its counter-part in Southern Rhodesia. Undoubtedly there are parts where trees can be profitably grown. Even now a stranger coming to Rhodesia cannot help noticing the numerous successful attempts which have been made to propagate various kinds of exotic trees and shrubs. All honour is due to the public-spirited men and women who are far-seeing enough to realise the importance not only of conserving and properly utilising the natural forest resources, but of improving and adding to their area by introducing and testing species drawn from all parts of the world.

Near Salisbury at the Government Forest Nursery experimental plantings have been made with various kinds of trees. While the full history of the experiments has not yet been investigated, it will perhaps be of interest if some details of growth are given of two species of eucalypts, namely:—*Eucalyptus tereticornis* (forest red gum) and *Eucalyptus citriodora* (lemon-scented gum).

Both these trees are hardy, the former more so than the latter; both have thick bark, which ensures protection from fire and insolation; both have thin crowns, which is somewhat of a drawback; both are capable of withstanding periods of drought.

The stand of *E. tereticornis* is not much more than one acre in extent and is stated to have been planted in the year 1907. If this is the correct date the trees are now 13 years old. The original planting espacement was 6 feet by 6 feet. From time to time trees have been indiscriminately cut and no record kept of the volume removed. The stand is therefore not an ideal one, but still it is sufficiently good to shew the possibilities of the tree. A sample plot of one-tenth of an acre was measured on the 17th of March, 1920, and yielded the following results:—

Inch classes. (Diameters at 4½ feet.)	Number of trees in each class.	Sectional area square feet. (Sectional area of class × number of stems.)
1	4	·0220
2	16	·3488
3	13	·6383
4	5	·4365
5	4	·5456
6	4	·7852
7	9	2·4057
8	7	2·4437
9	7	3·0926
10	4	2·1816
	73	12 9000

The average tree is $\frac{12.9000}{73}$ = .1767, which corresponds to a diameter of 5.6 inches. A sample tree was selected, felled and measured, the results obtained being: Total height, 58 feet; length of serviceable bole, 44½ feet; volume over bark measurement, exclusive of the crown, 4.92 cubic feet; under bark, *i.e.*, absolute volume of wood only, 2.44 cubic feet. The sample plot would therefore contain a volume of 359 cubic feet (4.92 x 73) wood and bark, or 178 cubic feet (2.44 x 73) wood only.

Converting these figures to acre measurement, an acre contains 730 stems, yielding 3,590 cubic feet of timber, including bark, or 1,780 cubic feet, exclusive of bark. Dividing the volume by the age of the wood, a mean annual increment is obtained of 276 cubic feet over bark measurement and 137 cubic feet wood only.

This stand has been kept too crowded. Had thinnings been made in a proper manner there would have been fewer stems, but the individual trees would have been larger.

An inspection of the diameter classers will indicate the numbers and respective sizes of the stems obtainable from a crowded 13-year-old stand.

The stand of *E. citriodora* is said to be as old as the *E. tereticornis* plot, and has also been irregularly thinned. A sample plot of one-tenth of an acre measured on the same date as the latter yielded the following results:—

Inch classes. (Diameters at 4½ feet.)	Number of trees in each class.	Sectional area square feet. (Sectional area of class × number of stems.)
1	2	·0110
2	9	·1962
3	7	·3437
4	4	·3492
5	5	·6820
6	13	2·5519
7	8	2·1384
8	5	1·7455
9	2	·8836
10	...	...
11	2	1·3200
12	...	...
13	1	·9218
	58	11·1433

The average tree is $\frac{11.1433}{58}$ = .1921, which corresponds to a diameter of 5.9 inches. A sample tree which was felled and measured gave: Total height, 52 feet; length of serviceable bole, 40 feet; volume over bark measurement, exclusive of the crown, 4.54 cubic feet; under bark, *i.e.*, absolute wood volume only, 2.81 cubic feet. The sample plot would therefore contain a volume of 263 cubic feet (4.54 x 58) wood and bark, or 163 cubic feet (2.81 x 58) wood only.

An acre approximately contains 580 stems, with 2,630 cubic feet, including bark, or 1,630 cubic feet, exclusive of bark. The mean annual increment is 202 cubic feet over bark measurement and 126 cubic feet wood only.

The two eucalypt stands measured do not shew a large volume per acre, and too much reliance must not be placed on the data supplied for the reason that removals often of the best trees have been made from time to time.

One thing, however, is clear, that within a period of thirteen years long straight spars, suitable for mine props, building timber, etc., can be produced. If the trees are thinned in a proper manner the diameter can be increased to a considerable degree. To find spars or boles of long length in the ordinary bush veld would require much searching for, if indeed they are obtainable at all. If this is so, is it not worth while for every farmer to have at his front door his plot of timber trees, not necessarily eucalypts, from which to obtain with a minimum of effort the timber spars, poles and fuel so necessary on an estate? Mining companies would also find it to their advantage to establish plots of quick-growing trees to meet the requirements of the mines and the persons employed on them.

From the results obtained with the limited experience, does it seem worth while to grow trees?

Improving Maize by Selection.

By C. Mainwaring, Assistant Agriculturist.

Maize varieties are improved mainly by selection. Various other systems have been suggested, but ordinary field selection is recommended for the busy practical farmer who wishes to improve his seed and who is not able to give the time and attention required by the more exacting method of pedigree selection. Pedigree selection offers the greater possibilities for improvement if properly carried out, but success depends absolutely upon the accuracy with which all details are conducted, and this system can only be recommended for the breeder who can spare the requisite time and careful attention demanded.

Our two standard breeds grown in Rhodesia, Hickory King and Salisbury White, are the results of careful selection. Selection in the lands is simple, profitable and satisfactory. Choose a variety well adapted to the local conditions, taking into consideration commercial demands. Select the land for the crop at least 400 yards from any other breed or strain of maize, and if maize grew on it the previous year, care must be taken to destroy any volunteer plants that may come up on the lands. During the autumn go carefully through the maize plants, having fixed in the mind the ideal type required, and select ears from the crop, paying particular attention to the following points:—

(1) Select only ears from plants which are growing in close competition with other plants, otherwise a plant producing a large ear may have had an advantage while it was growing in the field. It may have had greater space or a richer piece of soil or more moisture. Any of these conditions will enable a plant to produce a larger ear, but such an ear cannot be expected to yield well (unless it has the same advantageous conditions) when it is sown the following season.

(2) Selection for two or more ears per stalk is not likely to give increased yields (dent variety) unless the first ear is up to normal size, otherwise there is a danger of merely increasing the number of ears per stalk and reducing the average size of ears and quality of grain.

(3) Avoid plants growing in close proximity to barren plants.

(4) Select for general vigour of the plant strong stalks, leafiness of plant and width of leaf.

(5) Ears should not be borne too high on the stalk, and are preferable hanging downward at maturity.

(6) Avoid excessively long or short shanks.

(7) The husk should be compact and firm on the ear, and apex of ear well covered. In the Mazoe valley such insect pests as the weevil and grain moth are abundant in the lands, and where the husk does not completely cover the tip of the ear much damage is done, but in those ears which are completely and tightly covered, rarely if ever can a trace of weevil be found.

(8) Select only from plants free from smut, rust or blight.

Stalks with one or two suckers have been regarded as undesirable in field selection, but our experience shews that our two standard varieties sucker freely on rich soils, and therefore it is difficult to select ears only from suckerless stalks. There is no reason why stalks bearing good ears should not be selected, even though they have suckers.

The ears thus selected in the land will have to be reselected in the store room, and undesirable ears discarded; practical field selection on a large scale cannot be so perfect that none but desirable ears will be harvested. Particular attention in the store room selection must be paid to the following points:—Trueness to type; size and weight of

Pollinating maize plants by hand, Experiment Station, Salisbury.

Variety tests with White Flint Maize carried out on behalf of the Rhodesia Maize Association at the Experiment Station, Salisbury.

Variety tests at Experiment Station, Salisbury, shewing Dent (Salisbury White) on left and Flint (Early Cango) on the right.

ears; depth of grain; closeness of rows; regularity of rows; regularity of grain; shape of ears and character of tips and butts. Proceed in this manner each year; a special plot for the purpose may or may not be maintained, but hand picking should be practised regularly.

Many of our maize growers are firm in their opinion that it is necessary to get a change of seed frequently. They say their own variety or strain has "run out," and that they must buy seed from another locality. Is this necessary? It seems rather absurd when we think of it. How does the grower who sells the good seed keep his variety or strain from "running out" while he is growing it? It is true that the maize which a farmer is growing may be giving diminishing yields of inferior quality. But the difference is not due to any unavoidable tendency to deterioration inherent in the maize plant. It is largely the result of the difference in the manner of selecting the seed. If the maize used for seed has been taken from the thrashing machine, instead of by careful selection out of the crop in the field, the difference in quality and yield is accounted for. It is easy to understand why a certain strain or variety by good cultural treatment and selection may be somewhat improved, and how the same strains under poor treatment will deteriorate. We can take our own local breed, Salisbury White, and the Potchefstroom Pearl of the Union as examples. These two strains by careful selection became modified to such an extent that they were given names and sold as distinct varieties. It was quite proper and desirable to do so, but when the seed of these two varieties came into the hands of growers who were not careful to maintain the standard, they began to "split out" and tend to revert back to their original parents. We find all stages of this modification and reversions amongst these two strains. The general characters are similar, but the minor characters differ. Unimproved maize is sold for seed continually throughout the Territory, but it is pleasing to see our most progressive farmers by careful selection improving the variety they are growing, some of them to a very creditable extent; other farmers neglect this work entirely. It is difficult for some who wish to grow maize to buy reliable seed best suited to their soil, rainfall, elevation, etc. Few, if any, of our seedsmen maintain their own trial grounds, so it is impossible for them to give a completely accurate description of the seed sold. It is the general custom amongst leading seed firms in other countries to contract with farmers to grow special varieties of seed for them. The seed is supplied by the firms and the farmers grow it under the firms' observations and regulations to secure its proper management and purity.

It is quite apparent that there are some parts of the Territory adapted more particularly for one breed of maize, while other parts of the Territory are better adapted for other breeds. Hickory King and Salisbury White are our two principal breeds. Experience has shewn that under favourable conditions they yield well and produce grain of first-class quality, but where lands lack fertility, or are badly prepared, the hardier breeds, like the Flint Mealie, seem the fittest to survive. In other words, improved breeds like Hickory King and Salisbury White respond more readily, within the limit where they can be grown, to good soil and cultivation than do the hardier varieties.

The Mazoe Dam.

By A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.,
Government Irrigation Engineer.

This dam which is now nearing completion is the largest work of its kind yet constructed in Rhodesia, in fact is the highest masonry dam in Africa south of the equator. It is situated about 30 miles from Salisbury in a comparatively narrow gorge where the Mazoe River breaks through the Iron Mask mountains half a mile above its junction with the Tatagura River. The valley bottom has a width of 25 feet, widening out to 400 feet, at an elevation of about 100 feet above the level of the river bed. The physical features of the valley were favourable for the construction of an arched dam, and this was the type ultimately adopted.

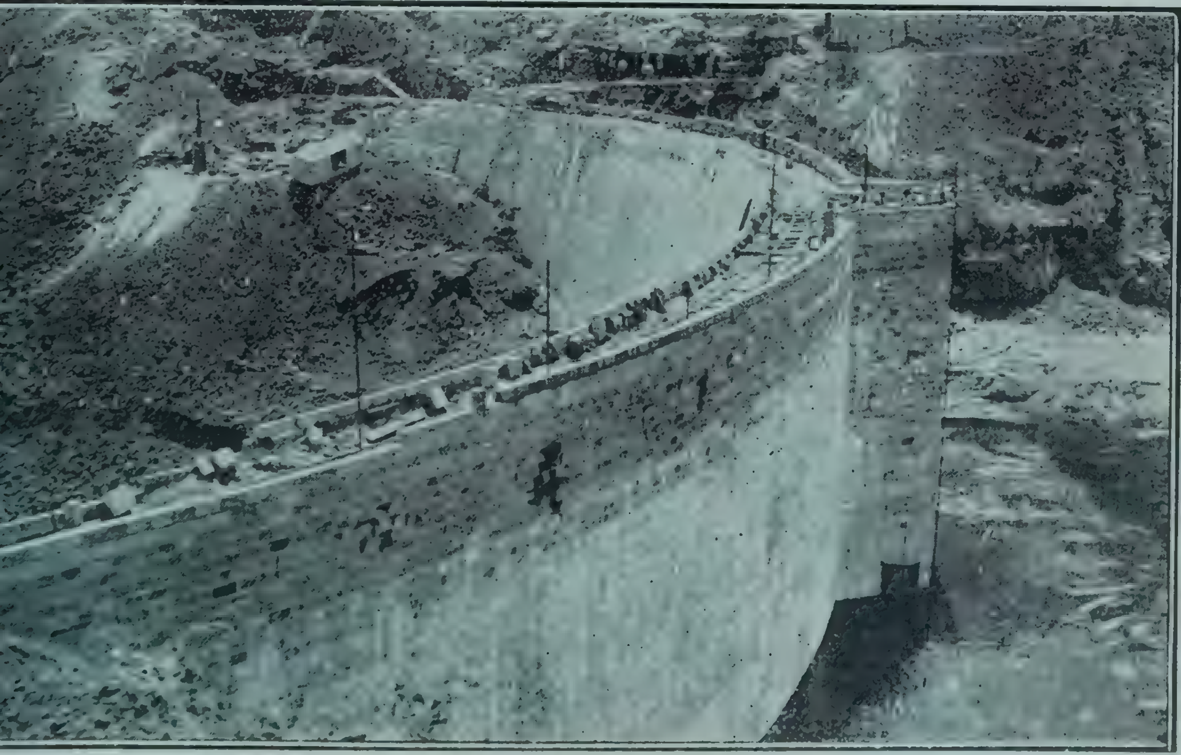
Dams of this type are curved in plan with their convex face upstream, and by taking advantage of arch action a portion of the thrust due to the water pressure is transmitted to the flanks, which enables a wall of less thickness to be built than is possible in the ordinary masonry dam of gravity section. The foundation rock in the bed is silicified felsite, which rises on a flat slope into the hillsides, where it is overlain with banded ironstone. The latter rock was found to be very much decomposed and fissured, and it was considered desirable to adopt means for consolidating it. This consisted of boring a large number of holes of two inches diameter over the area to be occupied by the dam and pumping in cement grouting under pressure varying up to 1,800 pounds per square inch.

The wall has been built of concrete throughout, and its main dimensions are as follows:—

Total height above river bed level	100	feet.
Depth of water to overflow level	95	,,
Length of wall in valley bottom	40	,,
Length of wall at top	477	,,
Radius of wall on centre line	175	,,
Thickness of wall at base	33	,,
Thickness of wall at 70 feet elevation	10	,,
Thickness of wall at top	10	,,

The wall is vertical on the upstream face and battered on the downstream face to within 30 feet of the top, from which elevation it is vertical on both faces. Spillways are arranged at each end of the wall, and all overflow except abnormal floods will take place over these, and not over the main portion of the wall. A valve tower built out from

Mazoe Dam, 22nd February, 1920; 74 feet of water.



Mazoe Dam, 1st September, 1919; closing sluice gates and water being impounded.

the centre of the wall on the upstream face is provided with four draw-off valves at elevations of 10 and 30 feet respectively above river bed. These enable water to be drawn off from the dam at any required depth. Four main outlet pipes each of 18 inches diameter pass through the wall from the bottom of the valve tower to the downstream toe.

The contents of the reservoir for the various depths are as follows:—

Depth of water. Feet.	Surface area. Acres.	Capacity. Acre feet.	Capacity. Million gallons.
0	0	0	0
20	5	60	16
40	78	550	150
60	230	3,000	816
70	370	6,000	1,632
80	585	10,700	2,900
85	680	13,800	3,750
90	790	17,500	4,750

The area of the top water surface is 790 acres, or approximately $1\frac{1}{4}$ square miles, sufficiently large to float the whole fleet of the Union Castle Co.'s steamers.

The object of the dam is the storage of storm water sufficient for the irrigation of about 6,000 acres of land in the Mazoe Valley. Of this acreage about 2,000 acres are situated on the Mazoe Citrus Estate, where up to the present 600 acres have been planted with citrus trees. Other owners of land situated on adjacent lower farms will be able to apply for the use of water stored in the dam, and it is contemplated in the near future that considerable development of their farms under irrigation will take place.

In view of the necessity of finding land for all the new settlers coming into the country, it becomes imperative that the areas of rich land as are found in the Mazoe Valley should be developed to their utmost capacity. It needs little vision to foresee that this land under irrigation will within the next few years support dozens of homes where to-day is found an isolated homestead. The small farm embracing 20 acres of irrigated land, 80 acres of good mealie land and the necessary grazing land will come into existence. Such small farms should be ideal for the fattening of cattle, dairying and pigs, as well as for citrus and tobacco culture, and should enable the holders to make a good living and shew a return upon the money invested.

The dam has been built by the British South Africa Company in its commercial capacity at a cost of approximately £120,000, with Messrs. Sir Douglas Fox and Partners as consulting engineers and Messrs. Pauling and Co. contractors. Thanks are due to Mr. C. D. Wise, of the Estates Department, British South Africa Company, for permission to publish, and to Mr. M. Randall for details contained in the foregoing notes.

The Home Orchard.

By A. G. Turner, Government Citrus Adviser.

In this article it is proposed to deal mainly with the general purpose, or utility, orchard for the farm and town plot, in which the proprietor wishes to plant one or two trees of every variety of suitable fruit for his own requirements.

It seems to be the idea of many people and farmers in this country that fruit trees once planted can be left to forage for themselves. The orchard is covered with grass and weeds the greater part of the year, and gets an annual scratching, which is called a ploughing or cultivation, as a sort of reminder that something is expected of it in the way of a return. The trees under these conditions naturally give no satisfaction, and the owner of such an orchard will say that it is no good growing fruit trees as they never produce any fruit worth having. This class of home orchard is to be found on many farms in the country, and if this principle were applied to the main farming operations it stands to reason that the farm could not be expected to give even a bare living. On the other hand, many orchards are to be found that would be a credit to any country, being well cared for in every way, and these give ample returns to the grower.

Fruit may be regarded as an essential part of the white man's diet in this country, if he wishes to keep himself and his family in good health. It is possible by careful selection of varieties of different kinds of fruit to have some sort or other fit to eat practically the whole year round in some parts of this Territory. Every farmer should select a suitable site for an orchard of assorted fruit trees; if it can be irrigated, so much the better; if no water is available, fruit can still be produced in sufficient quantity for household use, provided the trees receive proper attention otherwise.

The land selected for the orchard should be thoroughly cleared of stumps, roots and rocks, and the surface levelled off to as nearly an even gradient as possible over the whole area, so as to facilitate the after-cultivation. If the orchard is to be irrigated—and it is certainly advisable even for a home orchard—levelling very materially assists the application of water. The object to be aimed at is to level off ant heaps and any other uneven spots, the earth from which is used to fill up depressions, with a view to obtaining a comparatively even surface. This should be taken in hand, if possible, the season before it is intended to set out the trees, as should also the thorough breaking up of the soil by ploughing; if sub-soiling can be done, so much the better. Following

Spraying trees at Mazoe Citrus Estate.

on these operations, the land can be kept well harrowed and cultivated during the dry season, so as to be in good condition for planting out in the spring.

The next thing to be done is to stake out the site, using any system of alignment which is suitable to the ground or fancied by the individual as the best for his particular purpose, and which will at the same time give a general symmetrical appearance. In this respect it may be said that there are few things on a farm that shew up to such an advantage as a well-laid-out orchard, provided, of course, it is well kept up in the way of cultivating, fertilising and, when necessary, spraying. An orchard carefully planted with good varieties and well looked after is a big asset on any farm, while a neglected patch of trees is a discredit, and might often depreciate the value of an otherwise good farm.

The period for planting deciduous fruit trees is May to June, and citrus, November to February. It is possible to plant citrus trees in the winter for the purpose of a home orchard, but it is not advisable.

When the trees are planted, they should be cut back and watered immediately, and the stems protected either by white-washing or covering with old newspapers or grass; the latter, being rather inclined to attract ants in many places, should not be used if other means are available. The reason for this is to protect the young trees from the radiation of the sun from the hot dry ground, which is more harmful to young trees than it is later on in the summer, when the earth is moistened by rain. The young trees should receive a regular application of water, and the ground be kept loose around them until the rains come along in sufficient quantity to penetrate to the roots.

No manure of any kind should be given at planting, but if it is considered absolutely necessary owing to the extreme poorness of soil, a couple of handfuls of bone meal or a half bushel of thoroughly rotted kraal manure may be mixed with the soil in the bottom of the hole, care being taken that the roots do not come into immediate contact with it. A very much better plan is to apply the manure a few months later when the tree has commenced to establish itself at the beginning of the wet season and dig it well in, keeping at least a foot away from the stem of a young tree, and further as it grows older. An annual dressing of manure or fertiliser should be applied to the whole orchard in increasing amount as the trees grow.

During the wet season it is not advisable to do more cultivation than is absolutely necessary, as the puddling of the soil in its wet condition causes damage to roots. The best plan is to allow the weeds to grow a little after the first rains and then to turn them under with a plough. Following this, beans, vetches or any other cover crop should be sown, and this will improve the condition of the soil. Towards the end of the wet season, this cover crop should be ploughed under, and left to rot in the ground. Decomposition takes place fairly soon if the ground is well and deeply ploughed when in a moist condition. The usual practice in ploughing in beans as a cover crop is to commence when the plants are in bloom, or a little later, but it is possible on a small area to allow them to just ripen so as to pick the pods. In this case the haulms will get somewhat wiry, when it is advisable to cut them up with a disc harrow, which should be followed by a plough to turn them well under.

As soon as the rains are over, and right through the dry season, it should be made a practice to cultivate the orchard regularly, say every fortnight, in order to conserve as much moisture in the land as possible. To attain this object it is no use going over the land several times, following one cultivation immediately after another and then leave it for perhaps six weeks untouched.

Speaking generally, fruit trees should be pruned in this country from May to June, and unless this operation is done regularly and thoroughly, the result will not be satisfactory. The tendency here, as a rule, where pruning is done at all, is merely to behead the trees, that is to say, to cut back very severely or very lightly, according to the individual's own ideas, and to do practically no thinning out at all; the consequence is that a top of rank growth is formed so dense that there is little or no opportunity of growing good bearing wood. As a general principle, it is better to do more thinning out than heading back; this applies more particularly to peaches, plums and apricots for their annual pruning. Apples and pears require to be severely dealt with in this country for the first few years, until they have formed a really sound foundation on which to carry their future crops, after which time very little pruning is necessary, with the exception of a little thinning and cutting away of any broken or damaged limbs. Little knowledge of the proper pruning of fruit trees can be acquired by reading, as each tree of a different kind presents almost a new problem, which experience alone teaches one how to tackle.

Irrigation is a most decided advantage in a Rhodesian home orchard; for a commercial undertaking it is, of course, absolutely essential. If water is available, it should be applied to young trees as soon as the buds are swollen, so as to supply as much vigour as possible to the tree to make its new growth. If only one watering can be given, this is the time to give it, but if possible it should be continued at regular intervals, the ground never being allowed to get really dry; on the other hand, the ground should never be swampy until the rains occur. The same principle practically holds good for bearing trees, if a full crop of good fruit is desired. If, however, it is not possible to irrigate regularly, it is certainly advisable and worth the trouble to apply water before the trees commence to bloom, so as to get a good "set," and once again to fill the young fruit out and give it a chance to hold out until the rains supply the needful amount later. The ground should be well worked up after an irrigation as soon as it is dry enough to use whatever implement is most handy and satisfactory. This is to prevent evaporation, which is very high indeed at this time of the year in this country, thus conserving all the moisture possible for the use of the tree.

By reason of the small population of Rhodesia the local market demand for produce of any sort is comparatively small, and consequently any fruit that is grown in commercial quantities must be suitable for export. There are, however, exceptions to this, and if a proprietor has a suitable place within reasonable distance of any of the towns, good returns can be obtained from growing a limited amount of certain varieties of fruit. In this respect anyone proposing such a scheme would be well advised to apply for advice to this Department as to the most suitable kinds to plant. It would be well to remark here that fruit must be brought in for disposal at the markets in good merchantable condition. It does not pay the grower to handle poor fruit badly put up, neither will the consumer buy such stuff when better can be obtained, even if it is imported and at a very high price.

It may be said that many farms in the low and middle veld of Rhodesia have suitable sites for growing almonds and walnuts. Both these nuts are good commercial crops and always command a high price in South Africa and overseas. As these nuts will stand considerable transport, many farmers could with advantage grow them when too far from rail to raise many other crops.

It is necessary to use great care in selecting a site for almonds, and it is also essential to interplant varieties in order to ensure a crop. The three varieties given in the list of fruit trees at the end of this article are excellent nuts and cross-pollinise well; other good commercial varieties are being tried, but have not yet been planted long enough to prove whether they are satisfactory croppers here. It is usual for almonds to bloom in the month of July, and as at that period frosts are also likely to occur it is necessary to choose a well sheltered situation. Provided they are planted in the right location and varieties carefully selected, almonds give an excellent return and can be grown without artificial water; but to set a full commercial crop the trees should be irrigated before and after blooming. It is anticipated that considerable acreages will be planted to almonds and walnuts in parts of Rhodesia in suitable places.

A list is herewith given of fruit trees of various kinds, and varieties of each sort, which have been found to be generally suitable in different localities of Rhodesia. It may be said that in most cases the varieties which are most satisfactory in this Territory are almost identical with those doing well in similar regions of the Transvaal. The ripening period of each variety of the different kinds of fruit given below is shewn by the order in which it is placed, earliest being first under each heading.

Trees should be ordered from the nurserymen many months before it is necessary to plant, and it should be insisted upon that the varieties ordered are supplied, no substitutes being accepted. A nurseryman who has a reputation to keep up should be dealt with and only good trees ordered, *i.e.*, first grade trees, second grade very frequently being of doubtful value.

LIST OF FRUIT TREES.

Oranges.—Washington Navel, Jaffa, Pineapple, Mediterranean Sweet, Joppa, Paper Rind, St. Michael, Malta Blood, Valencia Late, du Roi, Mossurisie, Bitter Seville and numerous seedlings.

Naartje.—Dancy Tangerine, Old Cape, Beauty of Glen Retreat, Bombay, Emperor, Oonshiu.
Lemon.—Genoa, Villa Franca, Eureka, Mazoe.
Grape Fruit.—Marsh's Seedless, Triumph.
Kumquat.—Nagami.
Lime.—Tahiti, Mexican.
Pawpaw.—Large Round, Oblong and Pink-fleshed.
Mango.—Sabre, Peach, Beira (large green).
Avocado.—Green, Red.
Banana.—Common Natal, Lady's Finger, Zambesi, Cavendish, Custard, Red Madagascar.
Custard.—Red Madagascar.
Plantain.—Common.
Pineapple.—Smooth Cayenne, Queen, Common Natal.
Guava.—Red and White Large Indian, Red Chinese (small).
Persimmon.—Seedling.
Loquat.—Large Improved.
Grenadilla.—Mammoth Fiji, Common.
Tree Tomato.—Common.
Apricot.—Alpha, Early Cape, Royal, Tilton, Blenheim.
Peach.—Peento, Jewel, Angel, Waldo, Shackleford, Killiecrankie, Hall's Yellow, Florida Gem, Mamie Ross, Pallas, Florida Crawford, Common Yellow, Clingstone and numerous seedlings.
Plum (Jap.).—Methley, Santa Rosa, Burbank, Ogon (Shiro Smomo), Wickson, Satsuma, Kelsey.
Pear.—Bon Chrètien (Bartlett or William), Keiffer, Le Conte, Beurré Hardy, Easter Beurré.
Apple.—Christmas, Lady Carrington, Jonathan, Cleopatra, Delicious, King of Pippins, Prince Bismarck, Alfriston, Duchess of Oldenburg, Missouri Pippin, Lord Wolseley, Sturmer Pippin, Versveld, Wemmer's Hoek, Rome Beauty, Ohenimuri.
Quince.—Cape Selected, Rae's Mammoth.
Almond.—Nonpareil, I X L, Jordan.
Walnut.—English, French, Burbank and seedlings.
Fig.—Brown Turkey, Castle Kennedy, Adam.
Grape Vine.—Red Muscatel, Red and White Hanepoot, Hermitage, Catawba (Isabella), Crystal, Barbarossa, Waltham Cross, Almeria.
Strawberry.
Blackberry.
Loganberry.
Raspberry.

Poultry Husbandry.

THE PRINCIPLES OF BREEDING AND MATING.

By A. LITTLE, Poultry Expert.

BREEDING.

The wideawake progressive poultry keeper should ever be watchful to improve his fowls. He should not be content with merely choosing a flock; selection should go on year by year, and his fowls each year should shew improvement. This can only be accomplished with some knowledge of the principles of breeding and correct mating.

To throw together each year a few hens, irrespective of vigour, qualities and points, and to put a male bird with them, leads nowhere, except as a rule towards deterioration; certainly not towards improvement. The same applies and with greater force to what we often see, viz., the whole of the fowls, good, bad and indifferent, each year running with male birds of the same qualities and producing future stock of poor quality, no uniformity and bringing little or no profit. Such methods are hopeless; on the other hand, the employment of a little care and common sense—scientific methods are not, certainly in the elementary stages, necessary—will produce healthy, profitable stock and constant improvement.

There are three factors underlying all breeding operations, viz.:—

(1) Inheritance.
(2) Environment.
(3) Exercise of functions.

Inheritance denotes qualities and characteristics transmitted from the parents to their offspring. For instance, in poultry the female usually transmits size, shape and type; the male, laying qualities from his mother, head points and feathers. Both transmit health, stamina and vigour.

Environment denotes shelter, food, proper care, etc., and these play a very important part in the breeding stock, as tending to the production of future profitable stock.

Shelter from rain, cold winds, hot burning sun and dampness, the birds *must* have, to be in good laying and breeding condition and to produce healthy, vigorous stock. Discomfort has the reverse effect, and unhealthy conditions induce disease and destroy laying and breeding power. How often do we find this the case! The owners wonder why their birds do not lay, or, if they do so spasmodically, why the chicks from the eggs are difficult to rear, are weedy and often die. We *must* have, first and foremost in the breeding stock, health and vigour, in order to reproduce these qualities.

The food given to the birds must be wholesome, healthful and nourishing. It would seem hardly necessary to make this statement, and yet it certainly is, judging from the food often given to the fowls and the manner in which it is given. Fowls in runs can obtain no food but what is given to them, and therefore this must be all they require to keep healthy and in good condition, and to supply energy to compensate for the wear and tear on the system. Birds on free range can obtain all, or nearly all, they require, and *they* know what is best for them. It goes without saying that fowls must be properly cared for in every way if they are to produce good healthy stock and be profitable. Without this we have poor, miserable, unproductive stock, and it is strange how many poultry keepers do not realise this, and if they do are too lax to supply it.

Exercise of Functions.—This includes blood circulation; food digestion; muscle forming; the reproductive system, etc. The continued exercise of these tends to the best development, but the excessive use or abuse of one or other function acts detrimentally on the whole system, *e.g.*, forcing egg production causes weak stock. Birds selected for breeding purposes should never be forced for egg production, and for a little time before the breeding season commences should rest and run on free range and be treated as naturally as possible.

Too close confinement and too heavy feeding induce laziness; the result is an over-fatty condition. The eggs become less in number, what are laid are often unfertile, chicks hatched are weak and frequently the birds stop laying, become idle, listless and subject to disease. This is a condition very frequently met with in Rhodesia, and is one of the chief faults among poultry keepers. By means of *scratching* exercise (walking exercise is not sufficient) the circulation is increased, digestion improved, there is formation of flesh instead of fat, and all the functions are active and healthy, the birds alert and vigorous, the eggs strongly fertile and the chicks vigorous and thrifty growers.

Principles to be taken into account in Breeding.—*Heredity.*—This is the inheritance by the offspring of the characteristics of the parents at the time of procreation. Some qualities transmitted are apparent in the offspring, these are called "dominant"; others are not so evident, these are called "latent."

As an example of "dominant," we have very often in a male bird one spike of the comb bifurcated; this will be transmitted to nearly all his progeny, especially the male ones. On the other hand, as an example of "latent," we have the black ticking in the feathers of some White Wyandottes, handed down from their ancestors, the Silver (black and white) Wyandottes; this ticking will crop up every now and then, missing sometimes (*i.e.*, being latent) a generation or two.

No two chicks, however, are exactly alike, but uniformity to a great extent can be produced. The offspring resemble their parents within certain limits, and if it were not for the law of heredity, selection would be practically of no value; therefore how necessary it is, in producing good stock, to choose the parents with care.

Prepotency.—"The power of transmitting to the progeny good or bad points in a large degree." By selecting and mating together each year the very best birds, this power is intensified and the progeny shews an improvement, which naturally is again improved by mating together birds of similar excellent qualities. When a bird is found to be especially prepotent in transmitting to its progeny certain desirable qualities, such a bird should be well cared for and kept for breeding purposes as long as possible.

Atavism.—"The throwing back or reversion to a characteristic quality or fault in an ancestor." This is usually produced when two birds, each of different strain, are mated together.

Correlation.—This denotes "relationship among the body organs and systems." We have correlation between the blood circulation, the digestive system, the processes of growth, repair, reproduction, etc. If the digestive system is out of order, the circulatory system and others suffer: the digestive system is always impaired by dirt, sour food, lack of good, hard, sharp grit, etc. Continued egg production, which causes the bird to concentrate her energies on this alone, will upset the balance. It affects the other systems; the vital energies are exhausted and the bird dies. If the bird is kept for market eggs only, *i.e.*, as an egg machine, we wish to obtain as many eggs from her in as short a time as possible; but in breeding stock it is fatal, for not only is a good breeder lost, but the stock from her, run under such conditions, are weak.

Again, the faculty of early maturity and quick fattening may be brought to such a pitch that the internal organs are covered with fat. Globules of fat replace the egg clusters in the ovaries, the breeding qualities are weakened, fatty degeneration occurs and heart failure and death is the result. One prominent point can be, and often is, developed to excess, with the result that other qualities suffer.

A natural healthy correlation and co-operation of all the functions of a fowl must be maintained to obtain the best results. We see, therefore, how necessary it is to keep our birds, and *especially* the breeding stock, in good health if we wish for success and good profits; and yet how few realise the importance of this or carry it out.

Variation.—No two birds are ever exactly alike, no matter how carefully mating is carried out. For instance, changes of surroundings and new conditions will cause variations, for the birds find themselves unable to adapt themselves to these changes. This is most apparent with stock removed from one country to another; for instance, it takes some time for birds imported either from the Union or England to this country to adapt themselves to the altered conditions, and if bred from at once the progeny leave much to be desired.

But birds may be induced to vary gradually and by careful selection; the variations sought after may become fixed in a strain and transmitted to the progeny. It is in this way that the poultry breeder, combining the influences of environment, exercise of functions, heredity, prepotency and variation, can develop a strain of birds that will lay in season and out of season and 200 or more eggs per year. This, too, is the manner in which all the different breeds and varieties of fowls have, from the little wild jungle fowl of India (the Gallus Bankiva), of which our native fowl is the nearest relation, been produced.

On the other hand, variation may through carelessness, ignorance, unfavourable surroundings, etc., result in deterioration of the birds, and this is one of the many causes of failure. Nature never stands still; either there is improvement or deterioration.

Climate.—Temperature influences fowls and gradually causes variation. Warmth and comfort, resulting from proper shelter and congenial climate, encourages breeding and naturally increases the output of eggs. Cold, rain and dampness have, on the other hand, the opposite effect; the fowl stops laying and devotes all her energies to gaining bodily comfort; the blood, instead of going to the manufacture of eggs, has to furnish more fuel for up-keep of the body temperature; in fact, all the systems are endeavouring to counteract the discomfort at the expense of eggs and breeding powers. *This is the main cause of the scarcity of eggs in this country during the rainy season. If all keepers of poultry would only realise this, and realising it adopt methods for keeping their birds dry and comfortable, the scarcity of eggs would disappear.* Those who have done so (unfortunately they are yet few in number) have, during the recent rainy season, made excellent profits. We have practically no cold weather in this country, and we have the rain at one time of the year only, and yet what do we find? A great scarcity of eggs during this period; other countries, such as Canada, America, England, etc., are subject to either rain, cold, snow or frost all the year round, and yet the production of eggs is kept up; and why? Because the poultry keepers there adopt measures to keep their birds in comfort. Surely we in Rhodesia, who have only one adverse season to contend with, should do infinitely better than they in the production of eggs and good breeding stock?

Lack of ventilation and light will also cause deterioration in the breeding quality of birds and a diminished number of eggs.

Food.—Abundance of food of the right kind tends to encourage breeding, especially if the climatic conditions are congenial; and these are always present in this country during the breeding season. Foods of a nitrogenous and phosphatic nature, such as legumes, sunflower, inyouti (munga), insects, meat, thick separated milk and nearly all green foods, help to develop egg production, breeding powers and flesh formation, and should predominate in the menu of the breeding pen. Fatty and starchy foods, such as mealies, wheat, oats, barley, rice, etc., favour fattening, and care must be used when feeding these to breeding stock.

Exercise.—This is *most* important for breeding stock; without it we have decreased egg production, unfertile eggs, addled eggs, dead in shell and weak chicks which are not worth rearing, and if reared are unprofitable as layers and *no good* as future breeding stock. The *only* exercise which affects the whole system of the bird and which is of any use is scratching exercise, and plenty of it.

Line Breeding.—Every flock of fowls contains a best male and a best female, *i.e.*, excelling in health, vigour, stamina, shape, type, productive qualities, etc. ; the mating of these two birds together (provided they are not brother and sister), and particularly if they are prepotent in transmitting their valuable qualities, should always produce progeny of exceptional excellence; *but they must have no weak characteristics.* Now if we mate these together, we get in the progeny half the blood of each. The following year choose the best daughters from this mating and mate them back to their father, and the best son mate back to his mother. This gives us two pens, viz. (1) the sire pen or line and (2) the dam pen or line. There is three-quarters of the blood of the original sire in the blood of the progeny of the former, and three-quarters of the blood of the dam in the progeny of the latter. Now again take the best daughters of the former and mate them to their father, who is also the original sire; and the best son of the latter to his mother, the original dam; this will carry the poultry keeper on for three years. Each year he will breed only from his best birds, and a careful breeder can continue this method for five or six years. In this way we get the blood, the qualities, the points, etc., fixed, with an improvement each successive year; and a strain with certain characteristics is developed. This is the method which is adopted to produce the heavy laying strains of the present day. In following this method, the breeder must naturally be very careful to eliminate any bird shewing any weakness or an undesirable quality, otherwise these will be transmitted and fixed. This is line breeding, *not* in-breeding or the mating of sister to brother, which is not to be recommended except for a special purpose and only by the most careful and experienced breeder. From the above it will readily be seen that an improvement each year is a certainty, but by the introduction of unrelated sires each year, except from the point of view of extra vigour, improvement is very uncertain and can only be achieved by careful selection of the sire and a knowledge of his ancestry; and even then characteristics, points and strain cannot be fixed.

Cross-Breeding.—This is only advantageous when it is necessary to improve common fowls and when the male bird used is of exceptional vigour, prepotency and is strong in all good qualities.

Good healthy young cockerels mated with two-year-old hens ensure added vigour and easy rearing of the young stock. If the birds are obtained from a distance, the progeny will be still more vigorous, but cross-breeding each year will bring with it no improvement, and furthermore, violent continued crossings will produce atavism.

The cross-breeding of two pure breeds, except perhaps in the case of one or two breeds for table purposes, is not to be recommended. For instance, if a laying breed and a table breed are crossed, the resulting progeny will not be as good layers as their parents on the one side, nor as good table birds as those on the other; and they themselves naturally cannot be sold as pure-bred stock for breeding, nor the eggs from the pen for hatching purposes.

MATING.

The best results as regards health, strength and vigour in the progeny are obtained by mating together in the following order of merit:

(1) A vigorous young cockerel and two-year-old hens.

(2) A two-year-old cock and well-matured pullets.

(3) A vigorous young cockerel and well-matured pullets.

Well-matured birds, if they have come along well from the time of hatching and without any set-back, should be not younger than the following ages:—Light breeds—cockerel, 8 to 9 months old; pullets, 7 to 8 months old. Dual-purpose breeds—cockerel, 9 to 10 months old; pullets, 8 to 9 months old. Heavy or table breeds—cock, 12 to 13 months old; pullets, 11 to 12 months old.

Note.—In the heavy breeds the male bird should be 12 to 13 months, *i.e.*, just when he is passing from the stage of cockerel to cock.

The number of females to the male constituting a breeding pen depends upon several points, viz.:—

(1) The area on which the birds in the breeding pen are running; the smaller this area the less the number of females which can be given to the male with best results, *e.g.*, a vigorous young cockerel in a run 6 yards by 3 yards should be given only 6 to 8 hens, but if the birds are running on absolutely free range he could be given 50 or 60 with good results.

(2) A light-breed cockerel can be given more hens than a dual purpose one; and a dual purpose one more than a heavy or table one.

(3) For obvious reasons a cockerel at the beginning of the breeding season can be given more hens than he can towards the end of it.

(4) If the birds are made to take plenty of scratching exercise, again more hens can be given than when they are not.

(5) If the weather is dull, cold or wet, less hens should be in the breeding pen.

(6) Again, the poultry keeper has to use his observation and discretion. For instance, if he notices that the feathers on the backs of the hens are getting worn off, there are too few females in the pen and more must be added; for unfertile eggs will result from too few as well as from too many. Further, the male bird often has favourites, and the unfavoured ones should be removed from the pen and given to another cockerel, or if one is not available, used only for the production of unfertile eggs for market purposes.

The correct method of Mating.—Select the best males available, remembering the qualities which are usually transmitted, viz., laying qualities, head points and feather. Now choose hens as good in all points as possible, remembering too what the female usually transmits, viz., shape, size and type; but each of the hens *must* have those points well developed in which the cockerel fails, and *vice versa.* If they can be picked with the same good points on both sides, all the better, and naturally what is wished for can be obtained in the progeny more rapidly. It is no use mating together two birds possessing bad qualities. (For the necessary points and qualities, see the *Agricultural Journal* for October, 1918, and December, 1919, or Bulletins Nos. 299 and 343.)

Having carefully selected the birds on these lines, the females in the breeding pen will naturally be uniform, as will also their progeny up to a certain point.

If you have no suitable male bird and have to purchase one, then select the best hens from your stock, place them on one side and again select from these the ones that are most uniform in all points, *i.e.*, those which shew the same good points and the same faults; then obtain from a breeder a male bird which is good in all the points in which your last selection of females fail. This is your foundation; each following year you line breed, and need not purchase any further stock.

Double Mating.—Double or, as it is sometimes termed, cockerel or pullet mating is often employed to breed exhibition males and females.

A pullet mating produces pullets of standard quality with the expectation of sacrificing cockerel chicks and *vice versa*, *e.g.*, a single comb exhibition White Leghorn cock must have according to the standard a very firm erect comb. To get this promptly in the progeny, the male bird in the breeding pen must have as nearly a typical comb as possible, and be mated to females with erect combs; then, according to the laws of heredity, both the resulting cockerels and pullets will shew a preponderance of erect combs; but according to the standard the pullets should have lop-over combs; therefore this mating is of no use to breed exhibition females, and another pen is necessary, headed by a male bird whose comb is not erect or firm, but inclined to fall over. He must be mated to females with good lop-over combs; and so this method is adopted for shape and type, etc., in this and other breeds, and in addition feather in the variegated breeds. This is cockerel and pullet breeding; not, as so many imagine, a breeding pen to produce cockerels and another to produce pullets; as yet we cannot do this, and the breeder who first achieves it will make a fortune.

A few words on the general feeding of breeding stock will suffice here, for it is intended to deal fully with this in a future article on "Foods and Feeding for best results." Breeding stock to produce strong chicks should never be fed on wet mash. A little dry mash can be fed every alternate or three days, but I prefer to feed solely on hard grain. Ample green food (given even two or three times a day), not too much meat food, which is rather forcing, and plenty of thick separated milk, not forgetting, as is so often done, *always* an ample supply of good hard sharp grit, oyster shell or sea shell, wood charcoal and clean fresh water.

Ash Residues from the Burning of Peaty Soil.

By G. N. Blackshaw, O.B.E., B.Sc., F.I.C., Agricultural Chemist.

An interesting case of soil burning *in situ* came under the notice of the writer some time ago during a visit to the Lomagundi district.

The virgin soil in question was of the peaty nature frequently found in old reed land which has since become better drained. On the unburnt portions, very good crop returns are obtained where the natural drainage is satisfactory, but the freshly burnt areas are infertile, the length of time they remain so being dependent upon the depth to which the burning of the soil has taken place, which in this instance varied from a few inches to three feet.

In the burnt sections the soil had undoubtedly been set alight by veld fires, but by the digging of trenches round the spots on fire and by the use of water the burning had been confined to small areas.

In order to determine the character of the ash resulting from the burning of the soil *in situ*, and to compare its composition with that of the unburnt soil in its immediate vicinity, the following samples were taken and submitted to analysis:—

Particulars of Samples Taken.

Sample No. 1196.—Unburnt surface soil to a depth of 9 inches.

Sample No. 1198.—Unleached ash resulting from the burning *in situ* of soil similar to sample 1196.

The *results of analysis* of the above samples, after being air-dried, were as follows:—

	Sample No. 1196. Per cent.	Sample No. 1198. Per cent.
Soluble in hydrochloric acid. Sp. G. 1·16 (48 hours' extraction on water bath).		
Phosphoric oxide (P_2O_5)	0·27	1·53
Potash (K_2O)	0·02	0·03
Lime (CaO)	5·78	12·97
Magnesia (MgO)	1·03	2·81
Water-soluble matter before ignition	0·31	4 43
Water-soluble matter after ignition*	0·14	3·11
Total nitrogen	2·36	0·33
Carbon dioxide	trace	9·61
Water	15·56	
Loss on ignition: Organic matter and combined water	63 59	
Soluble humus	32·24	
Nitrogen in soluble humus	2·41	

*Composition of water-soluble inorganic matter—No. 1198:—

Calcium sulphate	1.90
Magnesium sulphate	1.05
Calcium chloride	0.06
Calcium carbonate	0.08
Total (calculated)	3.09 per cent.
Total (found)	3.11 per cent.

The notable features in the above results of analysis are:—

(a) The high proportion of water-soluble salts in the ash resulting from the burning of the soil, viz., 3.11 per cent.;

(b) The unusually high percentage amount of nitrogen in the unburnt virgin soil, viz., 2.36 per cent.;

(c) The very high proportion of soluble humus in the unburnt soil.

The virgin soil is comparatively rich in lime and magnesia, and therefore provides the basic material required for the fixation of the sulphur, which is present in the organic matter, as sulphates of lime and magnesia during the process of ignition, proof of which is afforded by the fact that the water-soluble salts in the ash chiefly consist of sulphates of lime and magnesia.

The phosphorus contained in the organic matter is similarly fixed as "phosphate" on burning. Although the ash contains 1.5 per cent. of phosphoric oxide soluble in strong acid, the phosphate, of which it forms a component part, is insoluble in pure water, and therefore does not appear as a constituent of the water-soluble salts.

In order to find an explanation for the high nitrogen content of the virgin soil, an examination was made to determine whether the indigenous flora was rich in nitrogen-gathering leguminous plants. The land from which the samples were drawn is more or less in the form of a saucer, and it was in the lower part of this saucer that the burning of the soil had occurred. In the lower part of the area very few leguminous plants were present in the natural vegetation, but on the higher ground to the east and west thereof leguminous plants were very numerous, so much so that in some parts they were an outstanding feature. The residue accruing from the decay of this leguminous vegetation on the higher ground may account to some extent for the abnormally high amount of nitrogen in the lower-lying soil in its vicinity, although the content of nitrogen in the soluble humus does not definitely support that view.

In regard to the high proportion of soluble humus in the unburnt soil (32.24 per cent.) and the amount of nitrogen in the soluble humus (2.41 per cent.), it is interesting to note that Hall, in his book "The Soil," quotes an analysis of a sample described as virgin "black vlei" soil from the Salisbury district, which contained 21.3 per cent. of soluble humus, the nitrogen content of which was 2.40 per cent.

Snyder in reporting upon the nitrogen content of humus formed from different sources* states that humus from green clover (botanical order *Leguminoseæ*) contained 8.24 per cent. of nitrogen, whereas that from oat straw (botanical order *Gramineæ*) contained 2.50 per cent. It is therefore inferred that the humus in the unburnt soil (sample No. 1196) was derived for the most part from the decay of grass flora and not from legumes.

Practical Treatment of Burnt Areas of Soil.—The ash resulting from the burning of the soil *in situ* (sample No. 1198) contained about 20 per cent. of carbonate of lime and 1.5 per cent. of phosphoric oxide; consequently its application to arable land should be productive of good results and is accordingly advised. The depressions caused by the removal of the ash can be filled with good virgin soil if necessary.

One of the earliest methods of bringing peaty land into cultivation was to dry the land by means of open drains, then to plough it and gather the clods into heaps, which were slowly fired and the resultant ash spread over the land.

Clay burning was similarly resorted to in former days as a means of increasing the available plant food and improving the texture of heavy soil, the soil being mixed with vegetable refuse and burnt in heaps, which were then spread over the land and ploughed in. This practice is a very wasteful one and is not to be recommended except in extreme cases, as it involves the loss of valuable humus and nitrogen in the soil burnt. However, in all cases where accidental burning of the soil has been caused by veld fires, the removal of the ash and its application to cultivated land can usually be regarded as a sound practice.

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*Bulletin No. 53, Minn. Expt. Stn., U.S.A.

Herefords.

THE MARANDELLAS STUD HERD.

By C. D. WISE, F.S.I.

Anyone interested in the Hereford should procure that excellent standard work "The Story of the Herefords," by Alvin H. Sanders. This book gives an account of the origin and development of the breed in Herefordshire, its introduction to the United States and rise to popularity in the western cattle trade, with notes on management.

If reference is made to the article on "Shorthorns" in the *Rhodesia Agricultural Journal* of December last, it will be noted that the Hereford comes third in the statistics giving the meat capability of different breeds at the Smithfield Shows in London of 1915-16. The figures give the average weight in pounds of all the animals of the different breeds exhibited in the classes for steers and heifers not exceeding three years of age, viz.:—

	1915.	1916.
Shorthorn	1,594 lbs.	1,639 lbs.
Sussex	1,579 lbs.	1,603 lbs.
Hereford	1,559 lbs.	1,533 lbs.

In considering the feeding capabilities of any breed, the "rustling" quality, hardiness, suitability for crossing with other breeds and time which elapses before maturity is reached must be taken into consideration. A good example of what the Hereford can do in this country was shewn by the result of Mr. Jobling's exhibit at Johannesburg Fat Stock Show last year, where his pen of five grade Herefords made a remarkable record, a full description of which was given in the December issue of this *Journal*.

Many of the leading ranching men in the cattle world hold that no other breed can touch the Hereford, not only for early maturity and hardiness, but also for the quality of the beef. Further, the Hereford will thrive and feed out where other breeds are more or less a failure. Here again is an example which emphasises the plain fact that parts of this country are suitable for one breed and parts for another. In Gloucestershire it was the custom to supply Hereford bulls free of charge to the dairy farmers in the Chippenham district, who were milking Shorthorns, and to purchase the calves as soon as born; these were hand-reared, and for feeding out for beef this cross could not be beaten.

The Hereford breed may practically be classed as "beef"; although not in first flight as "dairy" cows, they are good mothers, with plenty of milk to rear the calf. In comparison with the Shorthorn, the writer finds the Hereford pedigree cow can be kept in the Marandellas district on less artificial and home-grown feed (in the manger) than can the Shorthorn in the Shangani district. The Hereford therefore is a better "doer."

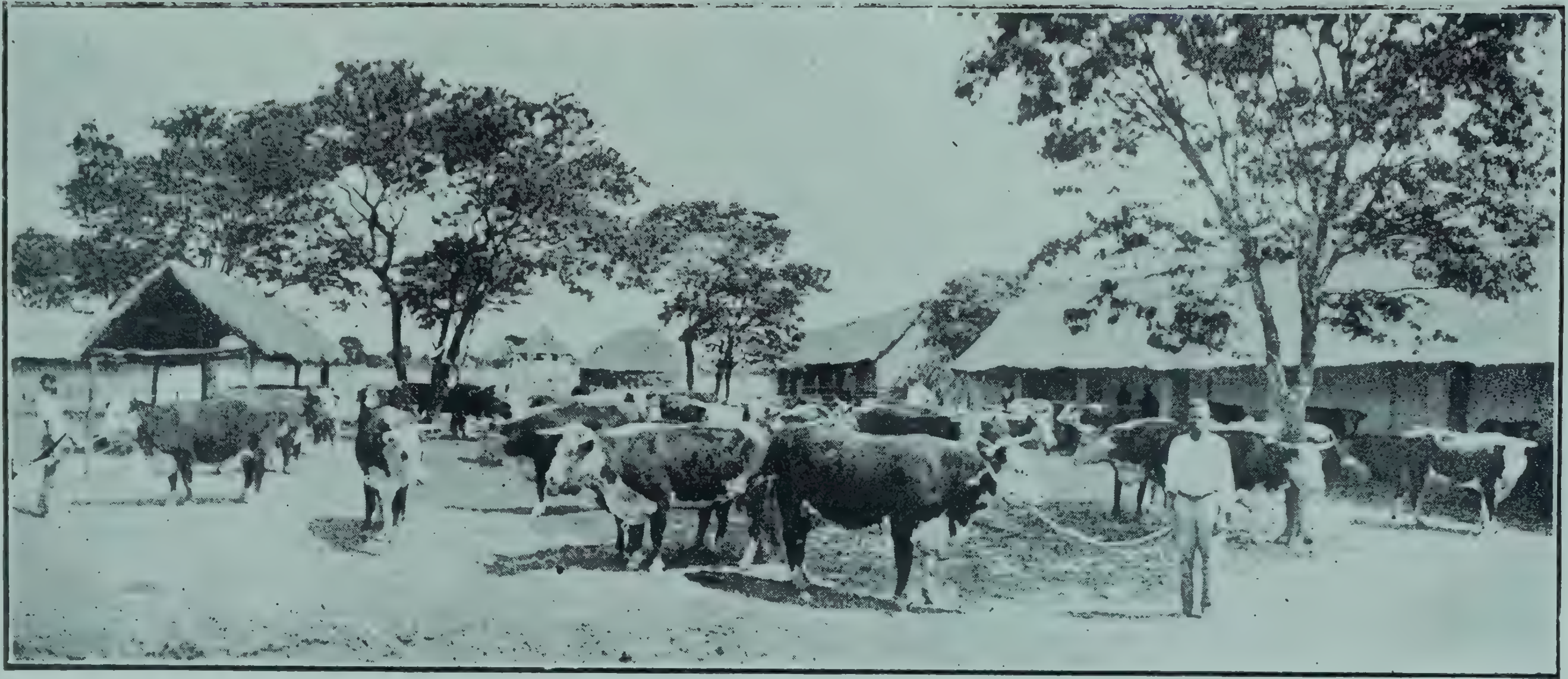
The Company has been crossing good Afrikander-native and Afrikander-Shorthorn cows with the Hereford, and so far is well satisfied with the results; this is on the granite veld, where the objective is to breed good class steers which will mature early. Provided the breeder has the right class of cow, the sooner he uses pure-bred bulls the better. Four bulls to every 100 cows and about 15 acres to each head is found on the ranches of the Western States to be about the average, and as far as one can judge this applies to most districts in this country.

Water is the great essential, no matter how good the grazing; without water the look-out is a poor one; fortunately water can be got at small expense in practically all districts in this country at an average depth of 100 feet. Cattle should never, if it is possible to avoid doing so, have to be driven to water, and if this unfortunately has to be done, then the limit should be two to three miles. A beast should be able to go to water when it wants to, and on no account to be rattled about by the abominable, but at the same time often necessitous, system of herding and kraaling.

In the humble opinion of the writer, the Hereford has a great future in this country, but so have many of the other breeds in the right districts and in the special line for which they are most suited.

The following opinion of Mr. Jastro, manager of one of the large companies in the United States, who brands 20,000 calves yearly, is worth noting:—". . . It is my judgment that, by carefully supplying the range with bulls of the right stamp, the Hereford is really the only breed for range purposes where water is scarce and feed at certain seasons of the year is short. On the other hand, the rancher who has lots of feed and plenty of water will in my judgment find the Shorthorns more profitable."

There is one thing we can be sure of in Southern Rhodesia, and that is that we have some of the finest country for ranching in South Africa. Taking into consideration the comparatively short time the country has been occupied and the still shorter time during which farming and ranching operations have begun to get under way, our progress has been great. The Union farmers have had the advantage of free sea rates for years, yet the importation of pedigree stock into Rhodesia compares favourably with that into the Union. Further, ask the "judges" who have come from the south to the shows at Bulawayo and Salisbury and other centres what their opinion is of the cattle put before them. There is one unanimous reply, and that is "Great, astonishing; we had no idea you had cattle like this up here." As time goes on they will be still more astonished.



Hereford Cattle at British South Africa Co.'s Estate, Marandellas.

At Marandellas the British South Africa Company has established a small herd of Herefords, and the photograph which accompanies these few notes depicts some of the herd, with a range of useful sheds, entirely erected by native labour employed on the estate, in the background. The herd consist of about 100 head of pure-bred and registered animals, of which 40 cows and 10 bulls have been imported from England. Of the bulls, three are now in use as stud bulls.

1. "Ivington Sterling Castle," H.H.B., vol. 50. Purchased from J. K. Hyslop, Ivington, Leominster, and imported into Rhodesia in March, 1919. Took first prize at Salisbury Show in 1919 for bulls under 18 months.

2. "Aldersend Choice." Imported from W. Griffiths, Aldersend, Tarrington, Herefordshire, in March, 1919. Was second (when 19 months old) at Salisbury Show in August, 1919, in bulls over 18 months and under 3 years old, being beaten by C. S. Jobling's "Devonby Damocles."

3. "Regulus," H.H.B., vol. 47, No. 33034. Bred by John Judge, Craven Arms, Salop, and purchased from F. D. Bach, Onibury, in 1916.

The remainder of the bulls are being used on selected cows on the range. The cows were imported from noted herds of Hereford breeders in England. At the Bulawayo Show sale last year eight pedigree yearling bulls were disposed of at prices ranging from £80 to £135.

The prices of pedigree cattle in England have been steadily increasing. A good class pedigree Hereford bull to-day costs £600 to £800 and upwards; pedigree heifers of 12 to 18 months cost £200 and upwards, landed in this country. The price of feeding stuffs has increased, oil cake is practically unprocurable, and wages are steadily on the upward grade. Breeders of pedigree cattle must, therefore, look for a material increase in the price of the pedigree animals bred by them, otherwise from a financial point of view the business will not be a paying proposition.

Agricultural Co-operation in England.

Some account of the striking development of agricultural co-operation in England during the last year will be of interest to the wider circle of agriculturists. Much was heard of the word "reconstruction" during the last stages of the war and for the first few months following it, but it is difficult to point to any achievement in this direction in most departments of national life. It is pleasant to be able to say that agricultural co-operation is an exception. The progress made during the past twelve months has been little short of phenomenal compared with the previous rate of growth.

Prior to the armistice, besides a certain number of co-operative dairy societies, some co-operative slaughter-houses and a large number of small societies dealing with eggs, poultry, fruit, market gardening and allotments, there were only six or seven large co-operative farmers' societies for the purchase of raw materials (feeding stuffs, fertilisers, seeds, machinery, etc.), which covered but a fraction of the country. In other districts there were either under-capitalised and struggling societies or no societies at all.

The prospects of English farming after the war have been by no means clear. There has been an unstable market in farmers' requirements and a feeling of uncertainty as to what will happen when control is removed in the various branches of the industry. The introduction of the minimum wage and of standardised working hours into agriculture has introduced a factor the future effect of which it is impossible to calculate. The prospect of severe competition from imported food is always present in the farmer's mind. In spite of governmental assurances, the farmer is for all these reasons justly apprehensive as to the future of his industry, in some cases even to the extent of fearing a return to the hard times experienced between 1880 and 1900.

The result has been to make him incline his ear favourably to the claims of co-operative trading, which leads to a real economy in production and a more advantageous system of marketing his produce. The fact that most other businesses have during the war made themselves strong by amalgamations and combines has helped in this process, for nowhere are there more combines, rings and cartels than in the agricultural trade.

The position was admirably put in a letter to a leading farming paper recently: "What is and has been," asks the writer, "the position of the isolated independent farmer working his business as a private trader? He buys a machine here, an implement there, a few tons of cake or artificial manure somewhere else, a few quarters of seed and feed corn or a few bushels of small seeds, and so on, in another place. These have all to be sent separately and naturally expensively. To express the matter in a sentence, he is buying retail and at a retail figure. But when he goes to sell his produce the boot is on the other foot; he has to sell to the miller, to the merchant or to the butcher wholesale, so that the individual farmer, working, selling and buying as a private trader, is buying in a retail market and selling in a wholesale one. But as one of a body of farmers under co-operation he has means in his hands of buying as well as selling wholesale."

During the year the Agricultural Organisation Society, the non-trading and non-political central organisation of the agricultural co-operative societies in England and Wales, has held nearly three hundred meetings all over the country to make the farmers' co-operative movement national in its scope. Its principal aim has been to establish in every county one or more large and well-capitalised societies for the purchase of the farmer's requirements and the sale of his produce, and in the case of counties where societies already exist, to get them strengthened by increase of capital and unified by amalgamations.

This campaign met with instantaneous success. During the past eighteen months societies have been formed in the following counties:—Northumberland, Durham, Cumberland, Yorkshire, Lincolnshire, Nottinghamshire, Warwickshire, Herefordshire, Devonshire, Cornwall, Somerset, Dorsetshire, Buckinghamshire, Surrey and Kent. Some of these societies aim at covering the whole of their respective counties. In other cases the counties were already partially covered, or in the case of the larger counties more than one society has been found necessary. Besides these new societies, in certain counties, such as Staffordshire, Derbyshire and Leicestershire, amalgamations have taken place, and elsewhere the older societies have vastly increased their membership and capital.

The leading farmers through England now take great interest in the movement, and the most prominent feature of the campaign has been the readiness of farmers to subscribe sufficient capital, in most cases £20,000 to £50,000, to start their own society on a thoroughly sound basis and be able to afford the best brains in the agricultural trading world for their management.

In January, 1920, the societies affiliated to the Agricultural Organisation Society included 469 trading societies dealing in farm requirements and produce, and 920 small-holders and allotments societies. Over one-third of the farmers in England and Wales hold shares in these societies, of which the annual turnover exceeds ten million sterling.

All societies are, of course, formed under the Industrial and Provident Societies Acts. Share capital is limited to £200 per member; interest is limited to 5 per cent. or 6 per cent. A co-operative society exists to make savings rather than profits, but any profits that arise after payment of interest, etc., and adequate provision for the reserve fund are divided on the well known co-operative principle, *i.e.*, in proportion to the business which each member has done with his society.

A further enlightening fact is that the Agricultural Wholesale Society formed two years ago to act as the co-operative wholesale society and the control trading body for agriculturists has had a growth commensurate with the growth in the counties. It is equipped not only to buy farm requirements in bulk, whether at home or overseas, for distribution to the individual societies, but also to dispose of their united produce in the great markets of the world. The whole of its shares are owned by the agricultural co-operative societies in the country, and its profits go back to the member societies in proportion to the volume of their trade with it.

The Rhodesian Egg-Laying Test.

There were 30 entries for this test—26 from Rhodesia, three from the Union and one from Bechuanaland. According to rule 20, giving preference to Rhodesians, if there were more entries than pens available, viz. 20, those outside the Territory automatically fell out. Three entries from Rhodesia were withdrawn before the ballot for pens took place, leaving 23 entries for the 20 pens.

Mr. F. W. Brokensha, Umtali, White Leghorns, drew 21; Mrs. Renton, Que Que, White Leghorns. 22; and Mrs. Michel, Salisbury, 23. Since the ballot, Mr. Bland, Pen 12, Umtali, Campines, and Mrs. Joss, Pen 4, Que Que, White Leghorns, have withdrawn, letting in Mr. F. W. Brokensha and Mrs. Renton, and the competitors are now as follows:—

Pen No.	Owner.	Address.	Breed.
1	H. Tatham	Penhalonga	White Leghorns
2	Mrs. Walleen	Bembesi	do.
3	A. Hampson	Umtali	do.
4	Mrs. Renton	Que Que	do.
5	A. R. Low	Gwelo	do.
6	R. W. Bands	Salisbury	Anconas
7	Mrs. Lloyd	Inyazura	White Leghorns
8	W. F. Williams ...	Bulawayo	do.
9	Mrs. Kimpton	Umtali	do.
10	Mrs. Gibbings	Avondale	do.
11	H. Fretwell	do.	Rhode Island Reds
12	F. W. Brokensha ...	Umtali	White Leghorns
13	C. L. Brown	Salisbury	do.
14	I. S. Wreford	Bulawayo	do.
15	D. O'Linn	Avondale	do.
16	A. E. Speight	Salisbury	do.
17	Mrs. Blaikie Williamson...	Banket	do.
18	Bray & Bull	Umtali	do.
19	Miss Sherry	Bulawayo	Brown Leghorns
20	Mrs. Deall	Old Umtali	White Leghorns

Among the breeds withdrawn or which automatically fell out were Campines, Black Leghorns and White Leghorns.

The birds on arrival will be carefully examined, weighed, dipped and placed in their respective pens. Eggs will be recorded as from 1st April and sold at 1/6 per lb.

The menu, which at the discretion of the Poultry Expert will be liable to alteration when necessary according to the weather or the condition of the birds, will be as follows:—In the morning half a handful of munga to each bird, in deep scratching litter; similarly one handful of crushed mealies or sunflower seed to each bird at 4.30 p.m. Dry mash will be before the birds in hoppers for them to help themselves, in the early stages of the test for one hour daily, subsequently all day.

Thick separated milk will be fed as often as available. Green food, as much as the birds will eat, of different kinds and chopped small, will be given morning and evening. Grit, charcoal, oyster shell and clean water will always be before the birds.

The grain fed will be as above, and one feed twice a week as a change of the following mixture:—Buckwheat, kaffir corn, and crushed dhal, peas, beans or monkey nuts. It will be noted that all the above are grown in Rhodesia. The dry mash will consist of mealie meal, wheat bran, monkey-nut meal and a little powdered charcoal, and when milk is not available fish meal will be added to this. Epsom salts at the rate of two teaspoonsful to a quart of drinking water will be given on alternate weeks; similarly and in the same proportion Glauber's salts will be given.

It should be noted that the birds will be confined to pens, therefore they can get no food but what is given to them, and this menu is only suitable for birds kept always in pens and not allowed any free range.

The Daily Routine.—The following daily routine of the work may be of interest to the owners of pens and others keeping poultry:—

6 a.m. to 8 a.m.—Clean dropping boards and houses.
9 a.m. to 10 a.m.—Give munga in litter and chopped green food.
10 a.m. to noon—General work.
Noon—Open dry mash hoppers.
12.15 p.m. to 12.45 p.m.—General work.
12.45 p.m.—Shut dry mash hoppers.
2 p.m. to 3 p.m.—General work.
3 p.m. to 4.30 p.m.—Collect, weigh, stamp, record and pack eggs.
4.30 p.m.—Give grain in litter and green food.
Dusk—Shut doors of houses.
Mondays—Spray houses; fill grit, etc., boxes; wash water and milk vessels with disinfectant.
Tuesdays and Fridays—Rake runs.
Wednesdays—Put clean nesting material, with a little lime and sulphur, into nest boxes.
Thursdays—Wash water and milk vessels with disinfectant.
Saturdays—Rake the runs and generally tidy up.

On the first Thursday in each month all birds will be dipped. The scratching litter will be added to every month, and completely renewed every three months.

The test will run for 48 weeks. Bi-monthly results and reports will be published in this *Journal* and monthly ones in the poultry journals.

Police Dogs used in the Union.

By C. D. Wise.

While in Grahamstown I was shewn the Police dogs which are used for hunting criminals, and through the courtesy of Colonel du Toit, Commissioner of Police, I also saw these dogs at work. The dogs are bred at Irene, near Pretoria, by the Government. The original dog was imported from Belgium; the breed is graded from the bloodhound and Airedale cross. Training is commenced when the dog is about four to six months old; the man who is to work the dog trains him, and this takes about six months. Both the man and the dog are trained together under the supervision of the head trainer at Irene. No one except the man in charge and who has trained the dog works it or feeds it; in fact, the dog will not take food from anyone except the man in charge of it—the "dog master."

Dog masters are as a rule members of the Police, who receive extra pay for this special work. Special men of a quiet, patient disposition who are fond of dogs are selected for the work. The dog master goes through physical exercises daily to keep himself fit, and the dogs are exercised and kept up to their special work daily.

Numerous instances were recited to me by Colonel du Toit of how criminals have been traced by these dogs. A dog and a bitch are as a rule always kept at the different centres. In the event of a crime, say, in a district 50 to 100 miles away, the dogs are taken out by motor or rail to the spot, and are then put on the spoor of the criminal; a curious fact is that a spoor 12 to 18 hours old is followed by the dog better than a fresh spoor. The spoor should be covered if possible by a box or tin until the arrival of the dog, and on no account should any attempt be made to follow it up before the dog arrives. As an example, a telephone message arrived in Grahamstown of stock theft on a farm 45 miles out; the farmer covered over the spoor with a box; dogs arrived next morning, followed the spoor some five or six miles to a spot where six boys were erecting fencing; the dog picked out one boy, who was convicted eventually, not on evidence deduced from the dog's actions—which is not accepted by the Magistrates—but on other circumstantial evidence.

The moral effect on the natives has also led to a considerable decrease in crimes such as assaults on women, stock thefts, etc.

I saw a dog hunt a native, who left the Police quarters and who went up the main street of Grahamstown, and locate him in a park outside the town some two miles distant. I also saw the dog pick out a native who had been sent on from the Police station, and who mixed

Nyamatama Weir.

Nyamatama Weir.

with six other natives at a spot outside the town. In each case the native's spoor was taken up by the dog on the footpath outside the Police headquarters.

These dogs should be of great service in a country like Rhodesia. Puppies can be obtained from Irene, and full particulars from the Union Government.

Nyamatama Weir and Roadway.

In this issue we publish two photos of the Nyamatama weir and roadway constructed by Mr. Percy Peech on the private motor road which runs from Mrewa to Mtoko through his ranch Nyaderi. Most travellers who have used this road will remember the old "Curly Drift," on the Nyamatama River, as a particularly unpleasant one to negotiate by car, and it is at this point that the weir and roadway were constructed during the latter half of the dry season in 1919.

The Nyaderi Ranch homestead is set back from the drift about a quarter of a mile on the Mtoko side, and it was with a view to holding back the river to near that point that the weir was primarily constructed.

The weir consists of large blocks of black diorite set in strong cement. The length is about 100 feet. There is a sloping lip on the up-stream side, and the wall is sheer on the down-stream face. The top of the weir is 12 feet broad, thus allowing two cars to pass in case of necessity. Our photos were taken in March of this year, shewing the river in spate, flowing freely across the roadway.

During the coming dry season it is the intention to erect a Blake hydram below the weir, and this will pump into a reservoir, 15 feet by 6 feet, placed on a spur of the hill behind the homestead. This will supply all the water necessary for the house, tree seed beds, orchard, bull stables, etc.

It is perhaps worthy of note that all roads on the Nyaderi Ranch are being made dead straight and lined by broad belts of trees. From the ranch tree seed beds 250,000 trees were planted out in 1918-19, and during this present rainy season no less than half a million trees have been planted. This programme is to be continued for some years.

Although the Nyaderi Ranch is primarily a cattle proposition, good crops of maize and monkey nuts have been grown. During this season several acres of cotton have been planted, and the crop is looking well. In addition, many acres of ground are being cleared with a view to tobacco cultivation being commenced during the present year.

Correspondence.

CASTOR OIL BEANS.

Sir,

I have a castor oil plant in my garden, and I get about a large sugar bag of beans from it each year. In order to economise, my wife decided to make soap from the beans. We found that shaking the beans up and down in an old bucket is the best way to loosen the husks, and then they are easily shelled. Then we followed the ordinary way of making farm soap. If the beans are simply stamped or crushed and not shelled, they, when turned into soap, make a very rich brown varnish for earthen floors. Be careful of clothes, as the stain will not come out. Also, separated milk and chimney or stove soot mixed give a black polish to earthen floors. The brown castor oil soap and the separated milk and soot polish both harden like cement, and may be washed.

Yours, etc.,

B. PRESCOTT.

P.O., Marula Siding.

VELD FIRES.

Sir,

The system adopted by the Matopo Farmers' Association of limiting veld fires, as published in your issue of December last, is good, but it can be made much better at a very small cost and with a much greater preventive value by adopting the following principle:—

Throughout Rhodesia there are well-recognised stony ridges on which the grass dries off a couple of months before the surrounding country, and can then be burnt without spreading further. Now, if the fire patrol and native Police were to start these ridge-fires two months earlier—say May and June—and burn these effective fire-guards, there would be no fear of the fire spreading, and there would be a long wide gap of burnt veld, which is the only sure way of stopping any big grass fire. The local natives would help with these ridge-fires, as it was their national custom before we came here. Any small fire getting out of control later on (and it is simply impossible to stop one in a high wind) would automatically come to an end as soon as it reached one of these long burnt ridges. I have seen its good effects in this district for nearly thirty years.

Yours, etc.,

R. S. FAIRBRIDGE.

Kingsley Farm, Old Umtali,
13th February, 1920.

Veterinary Report.

November, 1919.

AFRICAN COAST FEVER.

Mazoe District.—During the month 24 deaths occurred at the farms Avonduur and Leopard's Vlei.

ANTHRAX.

Further outbreaks of anthrax occurred in the Shamva section of the Mazoe district, and 13 farms are now infected. The total mortality to end of month was 81 head of cattle.

QUARTER-EVIL.

The mortality from this disease shewed a marked decrease during the month.

REDWATER AND GALL-SICKNESS.

A number of cases were reported from various districts throughout the Territory, due no doubt to the increased activity of ticks. At the Veterinary Research Station 23 head of cattle were immunised against these diseases.

IMPORTATIONS.

From the Union of South Africa:—Heifers, 6; bulls, 12; horses, 64; mules, 16; donkeys, 86; sheep and goats, 1,683.

EXPORTATIONS.

To the Union of South Africa:—*Via* Liebig's Drift by road—slaughter cattle, 1,002; breeding cattle, 2,539; *via* Bulawayo and Plumtree by rail—slaughter cattle, 1,199. To Northern Rhodesia:—Pigs, 2. To the Congo:—Sheep, 125. To Portuguese East Africa:—Horses, 3; donkeys, 3; breeding cattle, 138; slaughter cattle, 92; pigs, 46.

December, 1919.

AFRICAN COAST FEVER.

Gwelo District.—At the Hunter's Road infected centre 5 animals were destroyed, all of which shewed Coast Fever by microscopical examinations.

Mazoe District.—One death occurred at the Leopard's Vlei infected centre.

Umtali District.—A fresh outbreak occurred on the farm N'Odzi; one animal affected. There are 772 head of cattle on the farm, but only 47 in the herd are actually involved. It is impossible at present to explain the re-appearance of Coast Fever on this farm after nearly six years' freedom from infection. There has been no movement of cattle to it from the vicinity of centre at present regarded as infected, the nearest of which is over 50 miles away.

ANTHRAX.

Three fresh outbreaks occurred in the Shamva section of the Mazoe district, and 4 head of cattle succumbed. No deaths occurred at any of the centres where this disease was during October and November, shewing the efficacy of the vaccination practised.

QUARTER-EVIL.

The mortality from this disease shewed a considerable increase during the month; complete statistics are not available.

TUBERCULOSIS.

Two head of cattle exported from this Territory shewed lesions of tuberculosis on *post-mortem* examination at the Johannesburg abattoirs.

TICK INFESTATION.

A number of stock owners reported a heavy infestation of ticks, especially about the heads and ears of cattle. On the other hand, certain stock owners known to dip regularly and properly state that they have not noticed this condition.

HORSE-SICKNESS INOCULATION.

The results to date of the immunisation of horses against horse-sickness with vaccine supplied by the Government Veterinary Bacteriologist are as follows:—91 animals treated; mortality, 4. Marked clinical and thermal re-actions were observed in most cases.

REDWATER AND GALL-SICKNESS.

Fifteen animals were discharged from the Veterinary Research Station after undergoing immunisation against these diseases. Concerning these and 8 others still at the station, the Government Veterinary Bacteriologist remarks that "all these animals except one re-acted to redwater and gall-sickness as the result of inoculation, indicating that they have not been submitted to natural infection, and that the breeders have cleansed their farms from infected ticks."

IMPORTATIONS.

From the United Kingdom:—Bulls, 2. From the Union of South Africa:—Bulls, 28; heifers, 1; horses, 31; donkeys, 8; mules, 18; sheep and goats, 818; pigs, 10.

EXPORTATIONS.

To the Union of South Africa:—Slaughter cattle *via* Liebig's Drift by road, 679; *via* Bulawayo and Plumtree by rail, 1,108; donkeys, 20; pigs, 110. To the Congo:—Horses, 2; mules, 6; pigs, 18; sheep, 115. To Portuguese East Africa:—Slaughter cattle, 151; breeding cattle, 89; donkeys, 2; mule, 1; horse, 1; sheep, 65. To Northern Rhodesia:—Sheep and goats, 65.

January, 1920.

AFRICAN COAST FEVER.

Gwelo District.—At the Hunter's Road centre of infection the mortality was 6 head.

Mazoe District.—At the Avonduur and Leopard's Vlei infected centre the mortality was 2 head. On the adjoining farm Glen Divis a fresh centre of infection was discovered, but only one beast affected so far.

Umtali District.—At the N'Odzi infected centre 3 animals shewing high temperatures were destroyed, but no evidence of Coast Fever was found by microscopical examinations.

Matobo District.—Towards the end of the month an outbreak was discovered in the western section of the Matopos, and there is no doubt that infection has existed for some time. The extent of the infection is not yet known, but a large staff is on the spot endeavouring to locate it. After six years' freedom from this disease in Matabeleland, this outbreak is most disappointing. So far, there is no indication as to where the disease came from; the nearest known infection is at Hunter's Road, at least 150 miles distant, and so far as can be traced there have been no movements of cattle to which the outbreak could be attributed; but when it is taken into consideration that the infection may have been deposited twelve months ago or longer, the difficulty of assigning the exact time and means of its dissemination will be appreciated.

Melsetter District.—A recrudescence of infection occurred in a large herd on the farm Tarka; mortality, 35 head.

ANTHRAX.

Three head of cattle died on farms previously infected in the Mazoe district.

QUARTER-EVIL.

This disease was not so much in evidence as during the previous month.

SCREW WORM.

A number of cases of this parasite were reported from various districts, but generally it is not nearly as prevalent as during last summer.

HORSE-SICKNESS.

A slight mortality from this disease.

TUBERCULOSIS.

One case reported from the Johannesburg abattoirs amongst Rhodesian slaughter cattle.

IMPORTATIONS.

From the United Kingdom:—Bulls, 2. From the Union of South Africa:—Bulls, 38; horses, 32; mules, 36; sheep and goats, 1,566.

EXPORTATIONS.

To the Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 1,757; *via* Liebig's Drift, 299; breeding cattle *via* Liebig's Drift, 810. To Portuguese East Africa:—Bulls, 10; cows, 2. To Northern Rhodesia:—Pigs, 2.

February, 1920.

AFRICAN COAST FEVER.

Gwelo District.—At the Hunter's Road centre of infection the mortality was 19 head.

Mazoe District.—At the Avonduur and Leopard's Vlei centres the mortality was 19 head. Fresh outbreaks occurred on the farm Rocky Spruit, which adjoins the original centre of infection, and on the farm Sleamish, which adjoins Rocky Spruit. At the former 6 head died or were destroyed, and at the latter 8 head.

Melsetter District.—At the Tarka infected centre the mortality was 11 head.

Matobo District.—There has been no extension of infection from the area originally involved. The mortality during the month was upwards of 100 head.

ANTHRAX.

Two fresh outbreaks occurred: one in the Shamva section of the Mazoe district and the other in Mtoko district. In one case an ox died and in the other a cow. All the cattle involved were vaccinated.

This report is necessarily curtailed because of the interrupted mail service.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

The Agricultural Outlook.

The Territory has been blessed with another favourable season, and a good harvest is assured. The rainfall at the time of writing (late March) is normal throughout the greater part of the country, and in excess of the average in some districts. Although the actual acreage under maize this season and the yield cannot be computed, as the necessary figures are not yet to hand, reports indicate that increases will be recorded over last year, which, so far as yield is concerned, was the second highest since statistics have been collected. The plentiful March rains have brought on the late sown maize, which for a time was in a precarious position, and have nicely swelled the grain. The exhibits of maize at the forthcoming shows should be exceptionally good, and there should be no difficulty in maintaining the prestige of Rhodesian maize.

Tobacco has done particularly well this season, and although more sun during the ripening period would have improved the leaf, the crop should be an excellent one. Curing is now in progress, and the next few months will be a busy period for the tobacco grower. In some cases the work of grading the leaf will have to be done on the farm this year, and we would advise growers who have not read Mr. Taylor's article on the subject to apply to the Department of Agriculture for Bulletin No. 346.

Farmers who have moist vleis suitable for the growing of winter wheat would be well advised to sow as large an acreage as possible to this crop, for there are prospects of a short supply from the usual sources. The cotton crop is very promising, and the widely distributed areas where the crop is being tested this year should provide useful data.

Cattle are everywhere looking their best. The late rains should ensure ample grazing during the dry season, while there should be no shortage of water. Farmers should, however, not be lulled into a false sense of security and neglect to make provision for the winter by the conserving of hay and ensilage. Veld fires are likely to occur in spite of all precautions, and the man who fails to insure against disaster in this form is taking an unnecessary risk.

The sporadic outbreaks of African Coast Fever are disquieting, and have led to the appointment of a committee of enquiry which will shortly be taking evidence. A few cases of "screw worm" have occurred in certain districts, but the pest does not seem to be so prevalent as it was last year.

The export of slaughter cattle to Johannesburg is proving a lucrative source of income to cattle owners, as the figures of the traffic for the last four years shew:—

	No. of cattle exported	Value. £
1916	12,719	114,471
1917	13,221	132,210
1918	12,132	121,320
1919	22,245	222,450

These beasts are valued at the average price in Rhodesia, but the majority realised much more.

Farming Calendar.

April.

BEE-KEEPING.

Where numbers of the bee-louse are seen attaching themselves to the legs of bees and also among the quilts which cover the frames, this pest can be controlled by crushing them with the finger. In the cooler districts, crates that are partially filled with honey should be removed, and into the lift which they occupied plenty of warm clothing should be snugly packed.

CITRUS FRUITS.

During the early part of this month autumn budding can still be performed if sap is still up; in fact, if the season is late this operation is better done a little late than early, as in the event of late rains occurring, followed by a warm spell, the buds are liable to start growing, but are soon checked, the result of which is usually a stunted tree. Water by irrigation should be supplied to bearing orchards, unless unusual soaking rains have fallen late in season, followed by thorough cultivation and hoeing around trees. Continual watch must still be maintained for fruit-eating and codling moths. Spraying or fumigating against insect or other pests should not be neglected. Some early varieties may be expected to be ripening towards the end of this month.

CROPS.

The rains are practically over by this month, and the harvesting of early crops, such as buckwheat, linseed, teff grass and manna, will commence. The silo pit should be got ready, and the making of ensilage should be undertaken during this month. Napier's fodder can now be cut for this purpose. Veld hay for feeding should not be cut later than the end of this month. All lands that are available should be ploughed. The preparation of vleis for winter crops should be continued, and late varieties such as Algerian oats should be sown this month; also barley for an early green crop.

DAIRY.

The milking kraal at this season of the year is generally far from clean, on account of the rain. By cows getting covered in mud from the kraal, and the mud drying and subsequently being rubbed off during the process of milking, the milk becomes highly contaminated with numerous species of bacteria. These bacteria, or germs, are the cause of nearly all the trouble in butter and cheese making which arises at this period of the year, *i.e.*, during the wet season. To prevent the same, cows should be milked in a dry place, and free from dust. If the udders are found to be dirty just previous to milking, then the milker should clean the affected parts, as the udder, flanks, etc., with a cloth which has been wrung out in clean cold water—the udder should not be washed. The milker's hands should also be washed after each cow is milked. This all spells labour to certain people, but means all the difference between the production of first grade cream and third grade, or a saleable cheese and a non-saleable cheese. In the cheese-curing room, dampness is often prevalent during the wet season, with the result that the cheeses are often covered with green and white mould. This cannot altogether be prevented unless a properly constructed room is available, therefore wipe each cheese with a cloth every day, and the shelves should be scrubbed once a week with hot water to which a handful of washing soda has been added, and when dry should again be washed with water to which has been added a few crystals of permanganate of potash. The cheeses may also be wiped with a cloth dipped in the same water.

DECIDUOUS FRUITS.

Orders should be given to the nurseryman for trees required in August, September or October. Trees will be lifted in August, and may with advantage be kept in cool storage till required.

FLOWER GARDEN.

Sow sweet peas. Hardy annuals, such as candytuft, cornflower, eschscholtzia, gypsophilla, larkspur, mignonette, poppy, etc., may be sown in the open ground, and should not be transplanted. Perennials may be sown in boxes.

FORESTRY.

If any seed has been sown during the previous month the resulting seedlings should be pricked out into tins.

Young trees planted during the season should be looked over, and where double leaders have developed reduce to single stems. Any abnormal branches should be shortened. The same remark applies to trees planted during the previous season. The object sought to be attained is well grown trees of single stems free from heavy branches.

Operations for protecting woods from fire should be put in hand.

Breaking up of new land should be continued where further tree planting operations are contemplated.

POULTRY.

The rainy season is now practically over, and the supply of eggs will begin to approach the demand, not because *per se* the rain has ceased, but because the fowls cannot get wet and will be able to exist under more comfortable and favourable conditions.

The first chicks of the breeding season should now be out. Keep them healthy and growing, and they will be filling the egg basket next September or October. Those of the heavy and dual purpose breeds will supply broody hens when they are so much wanted at the beginning of next breeding season. Late hatched chicks never make good birds; they never lay till the following spring, when any old bird will lay; nor can they be expected to become broody when setting hens are most valuable. All the young cockerels of last season's breeding should now have been either killed or sold; only those that are being bred from this season should be present. There has been a good demand for breeding stock, especially for hens and pullets, and good ones are now almost unobtainable. Next year one can confidently guarantee that the demand will be even greater; therefore the poultry keeper who hatches early and properly will have the stock for sale (but it must be good) and will benefit thereby.

Foodstuffs are rising in price and give every promise of continuing to do so. All poultry keepers would do well, therefore, before it is too late, to grow what they can, and to store for future use anything in the way of grain, but especially beans, peas, monkey nuts, mealies, sunflower and munga. The same applies to green foods, such as sunflower leaves, dhal, Napier fodder; in fact, anything that will dry quickly in the sun after being picked green. When dry, break up, sift and store in sacks and use when green food becomes scarce in the same way as lucerne meal is. The repeated complaint of poultry keepers during the dry season is their inability to obtain green food, and without this eggs and health cannot be looked for. The remedy is to gather and store it before it withers and becomes scarce or practically unobtainable.

As the dry weather approaches, watch for insects. Dip your birds periodically, and take precautions against sand fleas by greasing the heads of your birds frequently, and watering the floors of the houses and ground around them occasionally with a solution of some non-poisonous disinfectant and water.

STOCK.

Cattle.—Cattle on the ranch should require little attention beyond dipping. Bulls should be kept out of the herd if January calves are not desired, and care should be taken to see that they are thriving and gaining condition for service again next month.

Towards the end of the month dairy cattle in most districts will begin to require some supplementary food. A small ration of maize if the price permits will be advantageous, but in any case they will repay some extra succulence such as Napier fodder, green maize stalks or ensilage, if any of the latter is left over from the previous year. The same applies to calves; and indeed supplementary food should be given to all dairy stock the moment they shew signs of falling off in condition. An early start tends to lessen the total amount of food required during the winter. All preparations for making ensilage should be completed by the end of the month. Any hay-making left undone should be attended to without delay. Attention should be given to water supplies for winter, and arrangements made to prevent water holes, etc., being trodden in as the supply shortens.

Sheep.—If grass seeds are troublesome, an area should be mown for grazing. The vleis should be avoided. It will probably be wise to keep the rams out of the flock for another month, so that lambs will not appear before October, when one may reasonably expect some grazing. This, however, is a matter for individual judgment in accordance with the nature of one's own farm or district.

TOBACCO.

Curing will be continued during the month. Care must be taken to yellow the leaf well before drying out. All bales or bulks of cured tobacco should be carefully examined weekly to ascertain the keeping condition of the leaf. Seed heads should be removed when the pods are brown and stored in a cool dry room. Lands should be ploughed and harrowed as soon as all tobacco has been removed.

VEGETABLE GARDEN.

Potatoes require ridging and tomatoes staking and tying up. Potatoes which mature after the rains may generally remain in the soil and be lifted as required. Vegetables planted out for winter crops should be well and continuously cultivated, which will bring them along quicker, with less watering. Beans and peas should be staked and tied. Beans, carrots, cabbage, cauliflower, peas, turnip, spinach, beet and radish should be sown for late winter crops.

VETERINARY.

Horse-sickness will be prevalent this month, as will blue tongue in sheep. The first symptom in the latter is laminitis, the second a protruding blue tongue.

WEATHER.

Along the higher ridges of the country we may still look for an inch of rain, more or less, during the month, though little, if any, can be expected in the Zambesi and Limpopo valleys and all low-lying parts of the country. As often as not, however, April is a dry month. In past years it has occasionally happened that early frosts have been recorded which put an end to the tobacco harvest, and may kill tender vegetables and flowers; but, as a rule, no such calamity need yet be expected, and if at all, only in frosty hollows.

May.

BEE-KEEPING.

The scarce supply of nectar, due to conditions of drought, will be responsible for a deficiency of stores. Where this is noticed, steps must at once be taken to supply the bees with artificial food in the shape of syrup. A feeder must be placed above the frames inside the hive. Never feed bees outside, as it promotes robbing.

CITRUS FRUITS.

Continue irrigating bearing orchards up to within three weeks of picking fruit, followed by cultivation and hand hoeing. The same remarks as in April apply concerning insect pests, etc. Washington Navel oranges will be ripening this month, and possibly some early ripening seedlings.

CROPS.

Crops such as summer wheat will be ready for harvesting. Majorda melons should be carted to some convenient spot, but not heaped. Ploughing should be continued on all available lands. Winter crops in vleis, such as Early Gluyas and other wheats, New Zealand oats and barley, should all be sown not later than this month. Napier's fodder may still be cut for ensilage during this month. This will give time for a considerable after-growth, which can serve as winter pasture.

DAIRY.

(See April.)

FLOWER GARDEN.

Sow *in situ* cornflower, larkspur, mignonette, poppy; sweet peas may also be planted.

FORESTRY.

Continue pricking out seedlings into tins. Deciduous trees which are propagated by means of cuttings should be taken in hand.

See that the fire lines are in order, and in the case of woods which have formed canopy remove inflammable material below the edge trees.

Place orders for any trees proposed to be planted during the ensuing season, so that nurserymen may make provision.

POULTRY.

The weather will now be getting cooler and the nights especially colder, and this must not be forgotten. The chicks must on no account be allowed to get chilled. Once a chick, especially in the early stages, is chilled its growth for the time being is checked and it frequently dies. It is so simple to put a little more chaff or cut hay on the floor of the brooder or coop, to put a sack over it, or, if the night promises to be extra cold, to take them into a comfortable shed. A little extra care of this kind means the difference between a brood of good healthy chicks and one of stunted weakly ones. On the other hand beware of over-crowding. More chicks are ruined by this than all the insect pests and diseases combined. One *so often* sees the after effects of this in poor weakly stock. Remember that the brooder which will hold comfortably 50 chicks when just hatched is far too small for that number in a fortnight, and half should be transferred to another of the same size and so on till the chicks are large enough to go into open-fronted coops.

Never rear chicks in the same brooders or coops as used in the preceding year unless they have been properly cleaned and disinfected. This should always be done at the end of each season, at the beginning of the next and *kept* clean all through the rearing season. Further, *never* run the chicks on the same ground as that used for chicks the previous season without in the meantime having grown a crop on it to take out all the taint and septic matter. On the whole it is best and safest to move the chicks on to new rearing ground each season.

Don't forget that when rearing chicks, insects, meat food of some sort or better still thick separated milk, chopped onion tops or onions, hard sharp grit, *not* sand, wood charcoal and clean water are absolutely essential; that dry meal is preferable to wet mash and that constant scratching for grain is all important.

As the cockerels begin to shew their sex, pick out the best according to the instructions given in the *Agricultural Journal* for October, 1918, or Bulletin 299. Put them on one side away from and if possible out of sight of the pullets, and get rid of the remainder.

Remember that chickens and fowls are creatures of habit and can be trained. If you don't wish your fowls to be always around the house or on the verandah, they must not be allowed to remain near it too long. It is as well, after they have grown their first chicken feathers, to gradually as they grow older move them farther away. One or two *good* dogs and traps properly set will keep the ground vermin in check, and the gun is the best remedy for hawks.

STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. In most districts it will be wise to conserve hay, maize stover, ensilage and a supply of any other cheap feed as a provision against possible late rains in the spring, and to enable one to maintain the younger or very old stock should occasion arise. (See Bulletin 331.) By the middle of this month dairy cattle will require more serious attention in the matter of feed, and in this connection we would refer our readers to Bulletin No. 345. Grass should be cut for bedding and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies and care taken that they are clean and sufficient.

Sheep.—The vleis having dried, sheep may be allowed into the lower lying veld. If the rams are put in now, lambs will arrive in October, which is usually a good month to arrange for. Those who favour winter lambs and have ewes lambing now will find a few handfuls of maize, together with chopped maize stalks or any other kind of available roughage or green stuff, a great help to the ewes in providing milk. (See Bulletin 287.)

TOBACCO.

Curing should be finished as early in the month as possible, to prevent loss from frost. The bales or bulks of cured tobacco should be examined weekly until sent to the warehouse. Tobacco seed should be shelled as soon as the seed pods are dry, and the seed carefully labelled and stored. All tobacco lands should be ploughed and harrowed.

VEGETABLE GARDEN.

Sow broad beans, peas, lettuce, spinach, parsnips, carrots, radish and beet. Constant cultivation is necessary.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

The dry season should have now set in, though averages of from a quarter of an inch to three-quarters are indicated in the official reports. Ground frosts at night have been recorded, but are very unusual.

Missing Numbers of "Rhodesia Agricultural Journal."

Vol. 1, Nos. 2 to 6.
Indexes for Vols. 1, 2 and 5.

The Librarian, Lawe's Agricultural Trust, Rothamsted Experimental Station, Harpenden, England, is asking for these, and is willing to defray expenses. It is requested that anyone who can supply will communicate with the Librarian, Rothamsted, accordingly.

Weather Bureau.

RAINFALL.

Station.	1920.		Seasonal to date.
	January.	February.	
MASHONALAND—			
Charter—			
Bushy Park	6·51	5·38	21·84
Enkeldoorn Gaol	6·86	2·96	24·14
Marshbrook	4·65	6·70	20·25
Range	7·77	6·77	25·75
Umniate	3·50	8·90	21·01
Vrede	2·08	5·34	16·34
Chibi—			
Chibi	10·36	3·40	20·04
Chilimanzi—			
Central Estates	7·01	4·51	25·15
Chilimanzi	8·12	2·81	20·84
Felixburg	13·08	5·17	28·73
Induna	8·64	6·75	29·63
Grootfontein (n.s.)	10·36	3·71	—
Darwin—			
Mount Darwin	10·38	7·87	27·44
Gutu—			
Eagle's Nest Ranche	9·74	7·32	29·93
Gokomere	8·64	5·33	22·58
Gutu	7·44	7·64	26·73
M'vimvi Ranche	8·67	9·86	29·72
Hartley—			
Beatrice (B.S.A.P.)	6·69	10·66	27·63
Cringleford	4·46	10·16	28·94
Elvington	9·11	12·59	30·36
Gowerlands	7·26	10·49	30·32
Hallingbury	4·21	12·66	28·60
Hartley Gaol	5·17	13·46	33·79
Hopewell	4·52	10·25	23·94
Kujary	4·01	11·29	—
Makwiro (Railway)	3·10	7·35	28·76
Ranwick	4·08	11·19	24·70
Shagari (Chevy Chase)	5·36	8·57	23·45
Inyanga—			
Inyanga	10·51	11·04	34·18
Inyanga Settlement	6·92	9·62	29·09
Rhodes Estate	10·10	14·82	39·22
St. Trias' Hill	11·24	6·57	31·46
York Farm	12·09	13·32	36·96

RAINFALL—(*Continued*).

Station	1920.		Seasonal to date.
	January.	February.	
MASHONALAND—(Continued)			
Lomagundi—			
Argyle	7·35	7·37	32·48
Darwendale	7·45	7·62	23·32
Duxbury Farm	8·82	5·62	29·80
Gambuli (Mukore)	9·68	6·90	30·90
Lone Cow Estate	11·34	6·32	27·90
Longmead	10·52	8·58	33·35
M'Vaumi Farm (n.s.)	6·66	7·27	—
Palm Tree Farm	12·49	5·90	37·06
Sinoia	9·10	7·82	31·42
Sipolilo	16·39	6·82	29·05
Makoni—			
Carlow Farm	7·00	7·87	25·84
Chimbi Source	8·62	15·35	40·01
Craigendoran	8·23	3·06	23·94
Delta	8·38	4·62	25·37
Eagle's Nest Ranche	9·04	6·50	26·61
Forest Hill	5·83	8·42	30·11
Gorubi Springs	8·33	4·29	27·29
Mona	10·53	8·32	33·21
Monte Cassino Mission	6·85	4·83	29·64
Springs	8·60	5·73	—
Marandellas—			
Bonongwe...	4·01	6·23	20·96
Huish Estate	4·48	5·24	20·86
Land Settlement Farm	8·34	5·51	21·21
Marandellas	5·54	8·61	28·05
Nelson	7·81	4·41	21·64
Selous Nek	8·35	10·73	21·25
Tweedjan	7·32	7·50	25·42
Mazoe—			
Avonduur	11·27	11·81	—
Bindura	7·66	10·92	25·72
Ceres	13·09	12·55	35·80
Chipoli	5·94	7·23	27·23
Citrus Estate	7·24	12·21	29·49
Concession (Railway)	7·80	9·50	27·39
Craigengower	10·45	12·61	32·32
Dunmaglas	6·12	9·11	22·87
Kilmer	10·54	13·33	32·99
Kingston	7·36	11·92	27·41
Lowdale	6·11	13·64	—
Mazoe Dam	10·20	11·12	22·09
Omeath	10·75	9·27	30·39
Protea (n.s.)	8·51	10·57	—
Ruoko Ranche	8·67	7·38	27·41
Shamva	7·77	9·96	25·96
,, Mine	7·65	12·75	30·14
Stanley Kop	5·33	10·54	27·31
Sunnyside	11·83	11·72	34·23
Teign	9·42	9·09	31·65

RAINFALL *(Continued)*.

STATION	1920.		Seasonal to date.
	January.	February.	
MASHONALAND—(Continued)			
Mazoe—continued			
Virginia	9·24	13·88	29·97
Volynia Ranche	10·51	16·04	33·94
Melsetter—			
Chipinga	9·69	7·68	26·55
Melsetter	16·43	8·29	36·13
Mount Selinda	14·69	13 27	42 30
Tom's Hope	15·79	13·12	40·99
Vermont	15·61	9·24	37 83
Mrewa—			
Glen Somerset	5·11	10·24	—
Mtoko—			
Makaha	10 62	14·30	31·83
Mtoko	6·43	6·55	—
Ndanga—			
Bikita	15·64	10·98	46·27
Chiredzi Ranche	4 54	6·05	—
Marah Ranche	11·99	5·94	—
Ndanga	7·91	9·52	28·36
Riverdene North (n.s.) ...	7·58	6·87	—
Salisbury—			
Avondale	6·96	10·29	31·56
Borrowdale (Hatcliffe) ...	7·57	10·03	29·80
Botanical Experiment Station ...	5·05	7·89	27·86
Bromley	9·26	5·54	27 74
Brookmead	7·33	9·13	32·54
Chishawasha	7·87	18·53	35·59
Cleveland Reservoir	7·84	11·05	30·27
Goromonzi	12·06	10·14	37·05
Gwebi	6·65	8·13	28·66
Meadows (The)	10·87	14·39	34·62
Salisbury (Gaol)	4·57	9·66	28·83
,, (Railway)	4·46	7·85	26·26
Sebastopol	4·75	12·99	28·28
Stapleford	7·07	11·89	36·71
Umtali—			
Chiconga	8·91	6·43	—
Muromo Ranche	5·31	6·23	19·08
Odzani	7·05	6·67	25·84
Odzi Drift...	7·34	5·70	25·69
Premier Estate	9·66	4·55	25·34
Reservoir, Umtali Municipality ...	6·88	8·52	26·95
Sarum	7·11	9·44	26·32
Stapleford	13·28	16·29	48·30
St. Augustine's Mission ...	8·25	7·27	30·45
Stralsrund	6·98	8·64	24·99
Umtali (Gaol) (n.s.)	7·40	5·34	—
Victoria—			
Brucehame	11·18	6·00	23·83
Histonhurst (n.s.)	4·96	8·19	—

RAINFALL *(Continued).*

Station	1920.		Seasonal to date.
	January.	February.	
MASHONALAND—(Continued)			
Victoria—continued			
Makorsi River Ranche ...	10·61	7·72	27·49
Silver Oaks	9·61	5·50	23·59
Stanmore	11·20	6·77	—
Victoria	7·92	6·10	24·12
MATABELELAND:			
Belingwe—			
Belingwe (n.s.)	7·53	11·31	—
Bubi—			
Imbesu Kraal	10·07	6·33	26·16
Maxim Hill	9·54	5·97	22·86
Bulalima-Mangwe—			
Empandeni	6·16	9·76	20·70
Figtree	9·52	9·94	24·81
Garth	9·00	9·02	24·85
Retreat	5·64	9·85	22·63
Solusi Mission	9·23	12·88	26·00
Tjompani	6·04	13·03	26·37
Bulawayo—			
Keendale	10·02	5·75	32·40
Fairview Farm, Khami Siding ...	8·26	7·24	20·07
Lower Rangemore	12·31	7·25	26·40
Saw Mills (Railway)	6·37	9·16	—
Gwanda—			
Gwanda (Gaol)	9·06	4·33	19·38
Mtshabezi Mission	8·19	7·78	23·05
Tuli	1·38	4·71	9·25
Gwelo—			
Globe and Phœnix Mine ...	5·90	13·42	28·34
Gwelo (Gaol)	10·46	8·65	33·41
Hunter's Road	4·15	8·98	21·36
Lalapanzi (Railway)	8·09	5·46	26·38
Lovers' Walk	8·57	11·86	30·01
Lower Gwelo (Somerset Estate) ...	6·28	8·09	24·55
Oaklands	8·57	9·00	28·69
Rhodesdale Ranche	7·25	4·17	20·26
Riverdale	6·86	9·81	27·44
Sikombela Farm	9·87	10·16	27·61
Woodendhove	14·15	6·05	29·30
Insiza—			
Albany	6·13	4·34	19·31
Filabusi	4·37	3·69	15·07
Fort Rixon	6·16	4·68	—
Inyezi Farm	6·68	6·68	19·76
Orangedale	8·51	5·73	24·99
Roodebeuvel	10·43	8·28	27·44
Thornville	7·56	5·54	23·37

RAINFALL *(Continued).*

Station	1920.		Seasonal to date.
	January.	February.	
Matabeleland—(Continued)			
Matobo—			
Matopo Mission	7·61	9·24	25·91
Rhodes Matopo Park ...	5·78	11·02	23·50
Nyamandhlovu—			
Edwaleni	10·36	8·91	26·93
Impondemi	6·18	4·23	—
Kalaka	5·44	8·70	21·07
Naseby Farm	7·27	11·58	26·65
Selukwe—			
Aberfoyle Ranch	6·81	8·84	—
Rio	5·97	7·19	24·06
Selukwe (Railway)	9·30	6·17	28·64
Umzingwane—			
Essexvale	7·37	8·43	22·60
Ntabenende	7·61	8·79	25·35
Wankie—			
Lynwood's Estate	4·32	9·56	23·00
Ngamo (Railway)	8·07	7·35	25·76
Victoria Falls	9·99	11·19	32·01

Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1920 April	May	June
Bembesi	Queen's Mine Hotel	V. C. Andrews	9	7	4
Bindura	Bindura	G. Askew	10	8	12
Bromley	Bromley	C. J. Shirley	1	6	10
Charter—Mgezi	Farmers' Hall, Beatrice	W. Krienke	29	27	24
Central	Umvuma	W. A. James	11	9	13
Darwin	Darwin	H. Wessels	16	14	11
Eastern Border (South Melsetter)	Helvetia	——	..	..	..
Eastern Districts	Good Hope Farm	G. F. Robertson	10	8	12
Enterprise	Various farms	R. Philip	7	5	2
Felixburg—Gutu	Felixburg	R. H. Brown	..	..	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	H. Charles	24	22	26
Gatooma	Gatooma	——	No	dates	fixed
Gazaland	Chipinga	J. Myers	3	..	1
Greystone	Various farm houses, Shangani	M. Kerr	..	..	..
Hartley	Hartley	J. de L. Nimmo	24	22	26
Headlands	Headlands	J. Grewar	No	dates	fixed
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. W. Twilley	10	8	12
Insiza—Shangani	Shangani	C. H. Lewis	17	..	19
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	10	8	12
Inyazura	Inyazura	H. B. Curling	21	19	16
Iron Mine Hill	Iron Mine Hill	T. Irving	10	8	12
Lalapansi	Lalapansi	B. J. Ingle	17	15	19
Lomagundi	Sinoia	J. G. Clarkson	3	1 and 29	..
Macheke	Macheke	W. L. McLean	No	dates	fixed
Makwiro	Makwiro	D. M. Syme	21	19	16
Makoni North	Makoni	J. G. Monckton	24	29	26
Makoni	Rusape	R. C. Maclagan	10	8	12
Marandellas, Northern	Marandellas Farmers' Hall	J. Thackara	3	1	5
Marandellas, Southern	Inoro	J. Gibberd	7	5	2
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	7	5	2
Mashonaland, Western Section	Various	J. W. Dunlop	No	dates	fixed
Matopo Branch, R.L. and F.A.	Sibali	——	No	dates	fixed
Mazoe	Glendale Siding	Mrs. Yoxall West	14	12	9
Melsetter North	Various farms	N. N. Rutherfurd	..	..	26
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	16	14	11
Northern Umtali	Farm Summerfield	A. Tulloch	..	..	26
Norton and District	Norton Store	W. Wrench	3	1	5
Que Que	Que Que	E. J. Ross	17	15	19
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	16	14	11
Selous	Various farms	A. L. Douglas	17	22	19
Selukwe	Selukwe	E. E. Somerset	No	dates	fixed
Shamva	Shamva	Capt. N. Stanley Stallard	..	19	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	10	8	12
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	17	15	12
Umtali	Royal Hotel, Umtali	J. S. Holland	1	6	10
Victoria	Victoria	——	9	7	4
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	10	8	12

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 206. Hints on Irrigation : Small Earthen Storage Reservoirs, by W M. Watt.
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No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F B. Willoughby.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 296. Citrus Nursery Work, by A. G. Turner.
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No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.
No. 305. Manure Supplies, by E. V. Flack.
No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.
No. 315. Descriptive List of Trees and Shrubs at Forest Nursery.
No. 320. Maize Grading, by C. Mainwaring.
Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-1919, by H. G. Mundy, F.E.S., and J. A. T. Walters, B.A.
No. 344. Ensilage, by J. A. T. Walters, B.A.
No. 348. Statistics of crops grown by Europeans in Southern Rhodesia for the season 1918-19, by F. Eyles, F.L.S.
Botanical Specimens for Identification.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 106. Cultivation and Preparation of Ginger.
No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 162. Rhodesian Maize. The Principal Types and their Points, by J. A. T. Walters, B.A.
No. 163. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
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No. 235. Crops unsuitable to Southern Rhodesia conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.

No. 298. Pise Tobacco Barns, by D. L. McLachlan.

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No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.

No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.

No. 327. Linseed, by C. Mainwaring

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No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.

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No. 346. Tobacco Culture—Grading on the Farm, by H. W. Taylor, B.Agr.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

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No. 139. Termites, or " White Ants," by Rupert W. Jack, F.E.S.

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No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.

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No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.

No. 280. The Maize Beetle, by R. W. Jack, F.E.S.

No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.

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No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.

No 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack. F.E.S.

No. 347. Tobacco Pests of Rhodesia, by R. W. Jack, F.E.S.

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No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.

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No. 324. Infectious Abortion of Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
Services of Government Veterinary Surgeons.

LIVE STOCK.

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No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C Simmons.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R C. Simmons.
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No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

No. 330. Poultry Keeping in Rhodesia—Incubation, by A. Little.
No. 331. Theory and Practice of Feeding Cattle in Southern Rhodesia, Part I., by R. C. Simmons.
No. 332. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part II., by R. C. Simmons.
No. 335. Poultry Husbandry: The Rearing of Chicks, by A. Little.
No. 336. Butchering and Flaying.
No. 337. Poultry Diseases: Enteritis, Tuberculosis, Coccidiosis.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 340. Notes on Theory and Practice of Feeding Cattle in Southern Rhodesia, Part III., by R. C. Simmons.
No. 343. Poultry Husbandry; Breeding and Selection for Increased Egg Production, by A. Little.
No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, by R. C. Simmons.
No. 350. The Basis and Beginning of Poultry Keeping, by A. Little.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 205. Home Butter Making, by R. C. Simmons.
No. 226. Classification of Clouds.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
No. 328. Pont l'Eveque Cheese, by J. B. Fisher, N.D.D.
No. 329. Gervais Cheese, by J. B. Fisher, N.D.D.
No. 349. The Hydraulic Ram, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Irrigation—Advice.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture. who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS VACANT.

Farmer, Victoria district, requires young man as pupil. Mealie growing, irrigation crops, dairying and ranching conditions. Board and small salary to suitable man for first year; thereafter good prospects.—Apply C. R.

SITUATIONS WANTED.

R. D. P.—By young man, position as learner on tobacco farm. Board in return for services.

L.—By elderly man, position on farm as assistant; small wages and keep. Thoroughly understands natives and has good knowledge of the language.

Bulawayo Show.

The Bulawayo Agricultural Society are holding their 13th Annual Show on 25th and 26th May. This society's show is THE cattle show of Rhodesia. Classes are provided for all the well known breeds, and while it may be said that the beef breeds predominate, yet there is no doubt that the milk breeds are always well represented by animals of excellent quality. Competition for the society's well known Thousand Guinea Trophy promises to be very keen again this year. The trophy is for the best bull on the show and is open to the world. The owner of the winning bull is presented with a replica of the trophy and £50 in cash. This trophy was first competed for in 1914, and was won by a Hereford bull belonging to Mr. C. S. Jobling, of Bulawayo. Mr. Drummond Forbes of Sandown won the trophy in 1915, 1916 and 1917 with his famous Shorthorn "Lomond." In 1918 and 1919 the trophy was awarded to Mr. G. C. Woodforde's (Gatooma) Shorthorn, "Raithby Blenheim." It will be seen that the trophy has not yet been won by any bull from outside Rhodesia, a fact which gives great satisfaction to the cattle owners of this country. At the last show there were many Union visitors present, and it is understood that they are coming to compete this year and endeavour to return with the trophy. In fact, Sir Abe Bailey has entered his famous Hereford "Bodenham Foreman" for competition. On the day following the show a sale of pedigree and well bred stock is to be held. The society first held a sale in 1918, and the support accorded them has been most encouraging. Sir Abe Bailey has supported the show and sale for the past two years, and it is interesting to note that at the last May show sale he disposed of 21 yearling Hereford bulls at an average of £110 per head. As a result of this he intends to sell a further lot of bulls this May. In 1919 the Friesland Cattle Breeders' Association sent a selection of bulls and heifers for show and sale. The results of this association's experiment were so satisfactory that they are exhibiting and selling again this year.

Show week is a gala week in Bulawayo. Visitors will find numerous attractions, and many will doubtless arrange for motor trips to the Khami Ruins and the "World's View," while those who can spare the time may proceed to the Victoria Falls after the show. The Bulawayo Turf Club have arranged for a race meeting to be held on 29th May. Entries for the show close on 8th May. Copies of the Bulawayo Agricultural Society's Prize List can be obtained from the Secretary, Mr. W. A. Carnegie, P.O. Box 244, Bulawayo, who will be pleased to assist exhibitors and others as far as possible.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal.* This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 78 of 1920.] [13th February, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 552 of 1919, and in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard areas in lieu thereof :—

Melsetter Native District.

(a) *Areas of Infection.*

The farms Grasslands, Sawerombi, Nooitgedacht, Morgensen, Mermaids' Grotto, Tarka, Glencoe, Hayfield, Rumble Rills, Springfield, Tilbury, Dunstan and Welgelegen.

(b) *Guard Areas.*

1. An area comprising the farms Ruwaka, Honey Kloof, Greyville, Murari, Lime Cliffs and the Mutambara Reserve, excluding a strip of four miles along the Odzi River.

2. An area comprising the farms Welgegund, Riverange, Camperdown, The Drifts, Nyanyadzi, Biriwiri, Admiral, Cambridge, Outspan, Fairfield, Commonage and Westfields.

3. An area comprising the farms Ingorima Reserve, Chamois, Stonehenge, Vooruitzicht, Lindley, Bellmont, Greenmount, Roede, Orange Grove, Nyhodi, Nyaruma, Lavinia's Rust, Springvale, Albany, Bloemhoff, Forestglade and Ingorima Reserve.

4. An area comprising the farms Clearwater, Wedgehill, Newcastle, Canterbury, Inhoek, Avontuur, Vorspoed, Sterkstroom and Randfontein.

No. 79 of 1920.] [13th February, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area :—

MATOBO NATIVE DISTRICT.

(a) *Area of Infection.*

An area bounded by and including the farms North Vreigevight, La Concorde, South Vreigevight, D'Hoop, and Forwards; thence by a line down the Ove River to where it intersects the northern boundary of the farm Ove North; thence south-westerly along the north-western boundary of the farm Ove North, the northern boundary of Gumella; thence by and including the farms Undza, Lushongwe, Malala, Ikezi, Rosenfels, Junction Valley, Matibi, Mount Edgecombe, Famookwe, Mount Francis, Warneford, Shashani, Edenvale, Wilton, Stretton, Leighwoods and Springvale.

(b) *Guard Area.*

Bulawayo, Matobo, Gwanda and Bulalima-Mangwe Districts.

An area bounded by and including the farms Kirby Block, Sandown North, Reserve, Vunda, Bickley, Beckenham, Penge, Norwood, Ascot Estate West, Welcome, Pendennis, Joe's Luck, Klipspring, Westacre Creek, Cardross, Honeydale, Merino Walk, Boomerang, Adams and Florencedale; thence by a line drawn along the northern and eastern boundaries of the Matopo Mountains to the north-eastern beacon of Zwemele Block "A"; thence along the northern boundaries of this block, Leilavale and Wenlock Block, and the western boundary of the latter to its southern beacon; thence along the southern boundary of Tuli River Farm, the north-west boundaries of Goto, Hiwatalalala's Kraal, the western boundaries of Mariberg, Mapani, Ratanyana, Pelele and Kanya Block to the south-western beacon of the latter; thence in a direct line westwards to the Shashani River and down this river to its junction with the Shashi River; thence up the latter to the southern beacon of Mphoengs Extension, and along the south-eastern boundary of the same to the farm Lewisdale; thence along the southern, eastern and northern boundaries of this farm, the eastern boundaries of Shesha Mangwe and Castle Block; thence by and including the farms Klipstone, Aliwal, Apology, Cliveden, Shaws, Klipfontein, Dawsons, Glenmore, Kwiti, Koolboy, Manama, Longford, Hay Grange, Watershed, Tjankwa, Tjedu and Pandis.

No. 130 of 1920.] [19th March, 1920.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farms Forwards, Sergeants and the eastern Matobo, His Honour the Administrator in Council has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to declare the following area to be actively infected with African Coast Fever for the purposes of the said Ordinance.

The area is the same as the guard area defined in Government Notice No. 79 of 13th February, 1920.

No. 131 of 1920.] [19th March, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 97 of 1920, and in terms of section 17 of Government Notice No. 21 of 1917, declare the following area of infection and guard area in lieu of those fixed by the first-mentioned notice :—

MAZOE NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Rocky Spruit, Avonduur, Leopard's Vlei, Wolf Hill, Glen Divis, Sleamish, Virginia, Virginia Extension, Clifton and Seddies.

(b) *Guard Area.*

An area bounded by and including the following farms :—Glendale Nos. 1, 2, 3, 4, 8, 7, 26, 27, 28 and 29, Simoona Reserve, Pimento Park, Wiseacre, Gosforth, Chindamora Reserve, Usk, Brecon, Volynia, Maggiesdale, Bloomfield and Laurencedale.

No. 141 of 1920.] [2nd April, 1920.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farms Sleamish and Rocky Spruit, Mazoe district, His Honour the Administrator in Council has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to amend Government Notice No. 266 of 1919, by extending the area therein declared actively infected with African Coast Fever for the purposes of the said Ordinance, as follows :—

Description of Area.

An area bounded by and including the following farms :—Glendale Nos. 1, 2, 3, 4, 8, 7, 26, 27, 28 and 29, Simoona Reserve, Pimento Park, Wiseacre, Gosforth, Chindamora Reserve, Usk, Brecon, Volynia, Maggiesdale, Bloomfield and Laurencedale.

No. 103 of 1920.] [5th March, 1920.

POUND ON FARM KOGHA.

IT is hereby notified that His Honour the Administrator has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Bulawayo, to abolish the pound on the farm Infiningwe, established by Government Notice No. 376 of 1913, and to establish a pound on the farm Kogha, in the Insiza portion of the magisterial district of Bulawayo. The latter pound shall be available for the public as from date hereof.

No. 49 of 1920.] [30th January, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
Dechow & Tweedale	Khami	Nyamandhlovu	Farm Fountain

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 111 of 1920.] [12th March, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
Bradfield & Son	Khami	Nyamandhlovu	Farm Silverstream

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 94 of 1920.] [27th February, 1920.

ENGINEERING ADVICE.

IT is hereby notified that His Honour the Administrator has been pleased to approve of engineering advice being given to *bona fide* farmers and others upon the terms and conditions set forth in the subjoined regulations :—

I. Informal Advice.

1. Informal advice of a general character may be given free of charge by the Engineering Branch, Department of Agriculture, to applicants making enquiry in person or by letter addressed to the Director of Agriculture, provided that the advice asked for does not involve field work or special office work.

2. Similarly, informal advice of a general character may be given free of charge by the officers of the aforesaid branch when on tour, provided that :—

(a) Government is put to no additional expense on transport;
(b) the advice can be given in the course of a tour and does not necessitate a special journey;
(c) no survey work of any kind is required;
(d) no subsequent office work is necessary;
(e) the officer affording the advice is not detained in any individual case for a period exceeding 24 hours.

An officer giving such informal advice may, however, furnish sketches and notes prepared on the spot to illustrate the advice given.

3. Applications for advice under the last preceding section may be made to the Director of Agriculture, and should be substantially in the form of Schedule "A" of these regulations. Such applications will be dealt with in the ordinary course in the most convenient sequence of farms affected according to relative geographical position, means of communication and similar considerations. Each applicant under this section to whose application attention can be given during any particular tour will as far as possible be advised beforehand of the route to be pursued so far as it affects his individual application, and of the extent to which he may be required to provide transport for the advising officer under the guarantee embodied in the subjoined Schedule "A."

N.B.—The Government will not be responsible for any advice thus informally given, nor for the correctness or otherwise of opinions expressed by any officer, though such advice and opinions will be given and expressed in all good faith.

II. Professional Advice and Surveys involving Detention and subsequent Office Work.

4. In the event of any applicant, after receiving advice under section 3 of these regulations, desiring that minor field operations arising out of such advice be at once undertaken, the advising officer, subject to the exigencies of other duty, may forthwith proceed to carry out such field operations, provided they will not occupy the officer for a longer period than *three days*, and provided that the applicant completes the guarantee contained in Schedule "B" of these regulations.

5. An applicant desiring a special visit by an Engineer for the purpose of obtaining his services to carry out preliminary surveys, investigations, or to give advice in connection with works which will not occupy the Engineer for a longer period than *six days*, including the time spent in travelling for the purpose required, shall apply for such assistance substantially in the form of Schedue "C" of these regulations.

6. Any applicant desiring professional assistance likely to occupy more than *three days'* actual field work for one or more officers shall apply for such assistance in the form of Schedule "D" of these regulations. Any applications made under the preceding sections which may be estimated to entail field work for a period exceeding *three days* may be dealt with in terms of Schedule "D."

7. The completed Schedule "D" shall be forwarded to the Director of Agriculture, and the applicant will thereafter be informed of the amount which will be charged in respect of the professional assistance desired. In arriving at the fee to be charged, consideration will be had to the time likely to be occupied by the officer or officers concerned, both in the field and in any subsequent office work, also to the cost to Government for all travelling expenses incurred and for sundry labour and material necessary for the work.

III. Professional Advice to other than bona fide *Farmers.*

8. Any application for professional advice by other than a *bona fide* farmer shall be dealt with in terms of sections 6 and 7 of these regulations.

SCHEDULE "A."

Application for Informal Advice from the Engineering Branch, Department of Agriculture.

Date,......................................

To the Director of Agriculture,
Salisbury.

Application is hereby made for professional advice under section 3 of the regulations regarding the giving of engineering advice to *bona fide* farmers.

I guarantee and undertake if called upon to provide suitable transport between such points as may be indicated to me for any officer deputed to visit my farm in pursuance of this application.

Signature of Applicant..
Name of Farm..
District..
P.O. Address..

SCHEDULE "B."

Application for Services of Engineering Branch, Department of Agriculture.

Date,..

To the Director of Agriculture,
Salisbury.

Application is hereby made for the services of an Engineer for a period not exceeding three days for the purpose of...

I hereby guarantee and undertake to pay to you the sum of 30/- per diem for each day or portion of a day that the Engineer is detained in carrying out the above work.

I further guarantee to pay a sum of 25/- per diem for any office work which may be involved subsequent to the field work in connection with the survey or design and preparation of drawings for the scheme concerned.

Signature of Applicant..
Name of Farm..
District..
P.O. Address..

SCHEDULE "C."

Application for Special Visit by an Engineer, Department of Agriculture.

Date,..

To the Director of Agriculture,
Salisbury.

Application is hereby made, in terms of section 5 of the regulations, for a special visit by an Engineer to farm...
in the district of...
for the purpose of...

I hereby guarantee and undertake to pay to you a sum sufficient to cover the actual travelling expenses and subsistence allowance of the officer, plus £1 per diem for each day or portion of a day during which the officer is absent from headquarters for the purposes of this visit.

I further guarantee to provide during operations in the field any necessary unskilled labour, materials or other contingent services required to the satisfaction of the said officer, or failing such supply by me to pay the actual cost incurred upon such services.

Signature of Applicant..
P.O. Address..

SCHEDULE "D."

Application for Professional Advice or Services of Engineering Branch, Department of Agriculture, for a period exceeding three days.

Date,..

To the Director of Agriculture,
Salisbury.

Application is hereby made for the services of an Engineer for a period exceeding three days for the survey and investigation of the work described below, under the terms and conditions prescribed in sections 6 and 7 of the regulations under which such services may be given, and by which I hereby agree to be fully bound in all respects.

Signature of Applicant..
P.O. Address..

General Description of Project.

1. Name of Farm (or Locality)...
2. District..
3. Nature of Work proposed (give as full particulars as possible regarding the proposed scheme, scope of survey and investigations) :
....
....
....

No. 142 of 1920.] [2nd April, 1920.

RABIES.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 520 of 1919, prohibiting the introduction of dogs from the Bechuanaland Protectorate.

RHODESIA

Agricultural Journal.

ISSUED BY

The Department of Agriculture,
SALISBURY, RHODESIA.

ADVERTISEMENTS.

The Journal is issued every alternate month.

Application for advertising space should be addressed to the Editor. The rates are as follows, *per issue*:—

Position.	Whole page.			Half page.			Quarter page.		
	£	s.	d.	£	s.	d.	£	s.	d.
Inner pages	2	8	0	1	10	0	0	18	0
Outer cover (back)	4	16	0	—			—		
Inner covers (back and front) and page facing Contents	3	12	0	2	2	0	1	4	0

A discount of 10 per cent. will be allowed for standing or consecutive advertisements running through six issues. Remittances, and electros where desired, should accompany orders. The right is reserved to discontinue the insertion of standing or consecutive advertisements should payment beyond the second issue be delayed.

The right of approval of all advertisements by the Director of Agriculture is reserved, and his decision as to the acceptance or rejection is final.

An additional charge may be made for advertisements printed in special type, equal to any additional charges made by the printers for setting up same.

Advertisements will be accepted from *bona fide* farmers wishing to effect sale, purchase or exchange of produce, live stock or farm implements, at a minimum charge of 2/6 per insertion of 20 words. Extra words will be charged for at the rate of 1/- for every 10 words.

Rhodesia Agricultural Union Congress, 1920.

[Photo by D. Carson, Salisbury.

THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture,
assisted by the Staff of the Agricultural Department.

PUBLISHED BI-MONTHLY.

Vol. XVII.—No. 3.] June, 1920. [5s. per annum.

Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the Journal. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* Journal *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

Agricultural Union Congress.—The recent Congress at Gwelo of the Rhodesia Agricultural Union was a pronounced success. A pleasing feature was the constructive nature of the resolutions and discussions as distinct from criticism without helpful suggestion. A large number of proposals were put forward and debated with keen interest, and the resolutions as adopted in their final form will no doubt receive full consideration by the Government. It is somewhat unfortunate that the Congress met at a later date than was originally anticipated and only immediately before the summoning together of the new Legislative Council, as it renders consideration of many of the proposals by that body impossible for at least a year. We congratulate Mr. C. S. Jobling on his election to the presidential chair for the coming year and for next Congress, which will be held in Bulawayo.

Entomology.—The Imperial Government has convened a Congress to meet in London during May of representatives of the Governments of British Possessions in order to exchange views on various important problems of economic entomology, and including, at the request of the Rhodesia Administration, the discussion of the tsetse fly problem. Mr. R. W. Jack, F.E.S., has proceeded to England to represent Southern Rhodesia, and it is understood that representatives will also be present from the Union of South Africa and Northern Rhodesia.

It will interest his farmer friends to know that Mr. Jack has recently had the high compliment paid to him by the American Association of Economic Entomologists of being elected a foreign member, a rare distinction and one highly prized by those who are so fortunate as to be honoured.

A Local Fibre Industry.—The fact that two companies have recently been formed and will shortly commence operations in Rhodesia as producers, buyers and manufacturers of fibres will be of interest to all our readers.

The first in the field was the Barberton Jute Company, under the management of Mr. H. T. Marks, who, as the name of his company implies, has already commenced operations in the Union, while within the last few weeks this Territory has been visited by Mr. T. A. Hawse Crampton and Colonel Fitzgerald, co-directors of the Northern Rhodesia Fibre Company. Both these companies are primarily interested in the fibre plant known in India as and under the trade name of Deccan or Bimlipatam Hemp (*Hibiscus cannabinis*), which occurs as a weed through many parts of South and Central Africa. Indeed seed from Africa is said to have been introduced into India in order to improve the quality of the Hibiscus grown there.

In Rhodesia Hibiscus is found as a weed mainly on sand veld farms, but that it grows well on richer and heavier soils is clearly demonstrated by the results obtained this year on the Salisbury experiment station.

At the beginning of last planting season certain farmers in the Makoni district were supplied with hemp seed by the Barberton Jute Factory, so that as a cultivated crop this fibre is being tested on a small scale both on the sand veld and on the red soil of the Salisbury experiment station. We have not yet heard how the sand veld crops promise, but there seems no reason to anticipate other than successful results. We are also informed by Mr. Marks that he has recently patented an extremely simple labour-saving machine for separating and cleaning the fibre subsequent to retting, and that these machines will be supplied to farmers who contract to grow fibre for his company.

The Northern Rhodesia Fibre Company has already opened its head offices in Umtali, and has commenced operations on a small scale, while their travelling instructor is now assisting Rhodesian farmers in the preparation of the fibre.

As a commencement it is understood that both companies are offering about £10 to £12 per ton for the fibre, but anticipate being able to improve on this offer in the future. They feel, however, that it is wiser to offer a smaller price to begin with rather than too high a one and then to be compelled to reduce it. The wisdom of this course will be better understood when it is realised that it is practically impossible at the present time to obtain any definite information regarding the financial aspects of this fibre industry. Nowhere except in India, as far as can be ascertained, has the trade in and manufacture of this fibre been at all stabilised, and both companies have much to learn before they can estimate the working cost of producing the finished article and thereby the price they can afford to offer the farmer.

Needless to say factories for the production of sacks, hessian, twine, etc., are the ultimate aim of both companies, and having in view the great benefit of such a local industry to the country we would urge as many farmers as possible to give this crop a trial on a small scale. Knowledge and experience in growing and preparing fibres is essential, and experimenters must realise that they cannot hope for and must not be discouraged if they do not obtain, complete success in their initial trials.

It may further be pointed out that if these factories are established and supported they may pave the way to the profitable utilisation of some of our native fibres and also of Sunn Hemp (*Crotolaria juncea*), which promises to prove so valuable as a rotation crop, and which should be doubly valuable if it will also return a profit as a fibre crop.

In view of the fact that supplies of seed may be insufficient to meet all requirements, those farmers who are able are advised to collect seed of the wild Hibiscus on their farms. Any surplus can be disposed of to the Northern Rhodesia Fibre Company at 4d. per lb. The company is now issuing a pamphlet on the cultivation and handling of Hibiscus, and notes on both this and other fibre crops will be published in the pages of this *Journal* between now and next planting season.

The Drought in the Union.—The disastrous effects of the drought which prevailed over a wide extent of the Union during 1918-1919 are recorded in the *Journal of the Department of Agriculture*, which has recently made its re-appearance.

Apart from the Transkeian territories, where it was not possible to obtain reliable figures, the drought is estimated to have been the direct cause of the following losses of live stock:—

Province.	Large stock.	Small stock.		
	Total: through poverty.	Through poverty.	Through slaughter of offspring.	Total.
	No.	No.	No.	No.
Cape	100,250	2,267,400	1,163,900	3,431,300
Natal	11,090	32,350	19,300	51,650
Transvaal	43,600	187,000	112,700	299,700
Orange Free State ...	61,385	974,000	620,300	1,594,300
Total ...	216,225	3,460,750	1,916,200	5,376,950

Losses of large stock were severest in the Cape Province, where 6.76 per cent. of the total cattle is estimated to have died. In the Northern Karoo 31.51 per cent. died, and in the Central and Eastern Karoo nearly 12 per cent. Heavy losses were reported also from the western high veld of the Transvaal and the south-west of the Orange Free State, estimated at 12.05 per cent. and 10.19 per cent. respectively of the total animals. In the whole Union it is estimated that 3.98 per cent. of its total large stock was lost.

In adult small stock the deaths through poverty were 11.02 per cent. of the Union's total. The Karoo and north-western districts of the Cape suffered most, the flocks there being depleted by from 20 per cent. to 24 per cent.

Enormous losses occurred among the progeny of small stock, the total for the Union being placed at 45.16 per cent. Again, the Karoo districts shew the greatest losses, the mortality in the Northern Karoo being as high as 89.05 per cent. The Southern Karoo with 78.11 per cent. and the North-western Orange Free State with 72.52 per cent. also suffered severely.

Crops suffered correspondingly owing to the lack of rain, and the figures published estimate the loss over the whole of the Union of maize at 5.123.760 bags, of wheat 762.800 bags, and of tobacco 1.972.800 lbs.

The drought was one of the severest that have ever occurred in South Africa, and as is stated in the article from which we have quoted, its evil effects extend beyond the actual losses of stock and crops. For instance the natural increase of live stock has been adversely affected through losses actually sustained in breeding stock, whilst the reduced capacity of breeding stock which survived the drought to produce offspring has also to be taken into consideration.

The figures we have quoted will, we think, surprise our readers. We feel sure they will join with us in feelings of sympathy to the farmers in the south who suffer from time to time such heavy loss from which happily we in Rhodesia have been exempt.

Veld Fires.—With the advent of the dry season grass fires may be expected. The subject was discussed at the recent Congress of the Agricultural Union, and it was decided to obtain the opinions of all the farmers' associations in the country as to the best means of repressing the evil. These reports are to be considered by a committee appointed by Congress. We have no doubt that valuable data will be obtained from this consensus of views, but in the meanwhile we would strongly urge farmers to avail themselves of the protection afforded by the law and to see that *adequate* fireguards are provided. The conservation of winter feed in the form of hay and ensilage is an essential part of any scheme of protection, and although we have time and again emphasised the point in the pages of this *Journal*, experience shews that it cannot too often be reiterated.

Rice.—We call attention to the interesting information collected from native sources regarding the production of rice in Rhodesia. The present scarcity and very high price of rice is likely to be continued for some time at any rate, and a further article is proposed to be published shortly giving hints to European farmers in this connection.

General Notes.—The growing season which overlaps the calendar year has proved exceedingly favourable, and the prospects for the coming harvest and for stock for the winter are excellent. Figures collected as at the end of the year shew an increase under crops, to 215,276 acres against 205,439 acres last season. The maize acreage has gone up to 177,470 from 173,313 acres, and the preliminary forecast of the crop was 908,000 bags. The tobacco acreage, which increased 60 per cent. last year, has this season nearly doubled itself, from 4,197 to 8,321 acres, with every promise of a very good crop. Ground nuts also have been planted on a much larger scale than hitherto. The area under crops other than maize has gone up from 15.6 to 17.5 of the whole, a sign of increasing attention to the side crops and of a tendency towards rotation, which is most satisfactory. The extensive trials of cotton are looking very promising, and attracting much general interest.

The report of Mr. Littlejohn Philip on bulk handling of maize and the use of elevators has now been received, and is under consideration.

The personnel of the Department of Agriculture has been strengthened by the assumption of duty by the newly appointed Forest Officer and a Dairy Expert.

The Testing of Dips.—We publish in this issue an article written by Mr. A. W. Facer, Assistant Agricultural Chemist, dealing with the testing of arsenical dips and the maintenance of the strength of the fluid. The notes compiled by Mr. Facer are supplementary to and explanatory of the instructions contained in the booklet supplied with the Champion dip testing apparatus, and should be used in conjunction with it. For easy reference this article will be reprinted in bulletin form, and copies can be obtained from the Department of Agriculture.

Cattle Inspectors at outside stations are being supplied with Champion outfits and are being carefully instructed in the use of them in order that they may analyse samples from their districts as well as be able to instruct others in the use of the apparatus. It is hoped by this means to reduce the large numbers of samples of dip at present sent to the Agricultural Laboratory and so enable the professional officers there to devote their time to other important work.

Devon Cattle Breeders' Society of South Africa.—Speaking at the annual general meeting of the Devon Cattle Breeders' Society of South Africa, Mr. St. C. B. Gwynn of Nyamandhlovu, who is president of the society, passed some interesting remarks in regard to the breed. Mr. Gwynn expressed the opinion, gained from many years' experience, that the Devon not only held its own, but matured a year earlier than the heavier breeds. This statement probably will not go unchallenged, and we should like to hear the views of breeders of beef types on the point. Referring to an exhibit of four bulls in the beef ranching competition Mr. Gwynn mentioned that one of the group, which was placed first reserve in a show of eighty-eight animals representing seven breeds shewn in groups of four bulls, had been sold for £425, constituting as far as he was aware a world's record for a Devon bull. This animal was purchased by the Agricultural Department of South-West Africa.

"**The Independent.**"—We welcome the publication under the above name of a weekly paper which we understand will be devoted very largely to farming interests in this country. There is a need for such a paper appearing frequently dealing with many matters of interest to the farmers, particularly the fluctuation of markets and domestic news such as it is impossible to publish in this magazine. We wish the new periodical every success.

Report of the Director of Agriculture for the Year 1919.

The condition of agriculture in the Territory gives clear indication of the new era which, with the advent of peace, is now dawning. During the war, with immigration suspended, with an exodus of men to the front and the cessation of supplies of all kinds, production, though not stopped, was at least checked, and agriculture had to mark time. The natural increase of stock, favoured by good seasons, continued, but the importation of cattle shewed diminution, and during the last two seasons the acreages cultivated decreased. Rhodesia was not in a position to benefit to any great extent by the war as did Australia, South America and the rest of South Africa, because she was not at the outbreak of the war in a sufficiently developed state to do so. Now, however, there are signs on all sides that these arrears of progress will be rapidly made up. There is a keen demand for such products as we can export and means of transport are more readily obtainable. Our surplus of maize was got away without the delay and loss experienced during war-time. The cattle export trade has gone up by leaps and bounds, and good prices are given both by the local meat packing company and by buyers from the south. The demand for our tobacco exceeds the supply, and there is every likelihood of further great expansion of this industry. Rhodesian tobacco, both the Virginian and the Turkish types, seems now to have become well established in public favour, and is eagerly sought by the manufacturer, whilst the recently granted Imperial preference should further extend the markets. With one crop only, oranges, is there any difficulty about export, but when they do reach the London market they are highly appreciated. Other products such as beans, ground-nuts, sunflower, butter, bacon and timber are all now readily saleable at remunerative prices, so that the present position and the future outlook for the prime producers is distinctly rosy. Their chief difficulties at the moment are scarcity of labour, cost of implements, fencing materials, fertilisers, freights and stud-stock.

A fresh and important feature in the agricultural situation in Rhodesia is the re-awakened demand for land. There appears to be an influx of settlers both from overseas and from the Union, and quite a number of sales have recently taken place. The addition to the farming community of both practical farmers from the south and of men released from military service is very welcome, and is likely to infuse fresh vigour into the country. The price of land has gone up with the demand; indeed, it shews a tendency to rise beyond what prospective settlers are prepared to give, and thus to discourage desirable immigrants, which would be most regrettable.

The year opened most favourably as regards the condition of stock, veld and crops, and continued so throughout the year, except for a brief anxiety in March, owing to an interruption of the rains which later was more than made good.

Agricultural Research.—Recognition of the prime importance of scientific research in the realm of agriculture was given in an important despatch from the Secretary of State for the Colonies, in which reference was made to the desirability of investigating all sources of raw materials required for Imperial trade and defence from the tropical colonies and protectorates. The institution was announced of a Colonial Research Committee entrusted with the expenditure of £20,000 per annum on scientific research in the lesser British possessions. Practical proposals were sought as to means by which assistance could be rendered. Here in Rhodesia some progress in these directions has been made without external assistance in the past, but the cost of scientific research is always considerable, and the benefits therefrom accrue to a large circle outside the place of origin, so that combination in the cost of the study of agricultural problems is very fitting. Examples of this may be seen in the case of the tsetse fly, which menaces vast territories, and in the production of foodstuffs, such as maize and meat, or of raw materials, such as cotton and tobacco, to meet the crying needs of the British Isles. There are many directions in which the newly constituted Colonial Research Committee may expend part of its funds in Rhodesia for the benefit of the Home country as well as of our farmers.

Cattle.—The season has been in every way favourable to cattle, with abundant grass and water and a mild winter, the only trouble experienced being due to the exceptional burning of the veld. Owing to the abundance of grass, coupled with superstitious belief amongst the natives regarding the causes of influenza and quarter-evil, veld burning, after several years of comparative immunity, became very general, and great suffering and loss was occasioned to cattle in consequence. The native is the chief cause of this recurrent waste, but not the only one; improvidence or carelessness by white men is often also to blame. Certain farmers' associations have taken the matter up, with conspicuous success, and there can be no doubt that with practical and earnest effort this evil might be very considerably mitigated; but in the great majority of cases no foresight is exercised, and fire-paths are often not prepared, winter feed is not preserved, and consequently heavy mortality, loss of increase and set-back in condition of the herds result.

The number of cattle in Southern Rhodesia has increased during the year to about 1,326,000 or 10.5 per cent., in spite of the export, totalling about 30,000, and increasing local consumption. This figure, though not quite final, is very close to the actual number, and reflects the excellence of the country for cattle.

Of this number, 673,431, or for the first time in our history over one-half, are in European ownership. The number of pure-bred cattle, 4,934, shews only a slight increase, as against 4,684 last year, possibly owing to a more strict definition of the term by those furnishing the returns from which these aggregates are compiled. The great demand is still for good bulls, and the difficulty of obtaining these only grows greater, and will do so, as the necessity and advantages of their use become more and more generally appreciated.

The export of breeding cattle as well as slaughter stock is now allowed from Southern Rhodesia *via* Liebig's Drift into the Transvaal under precautionary regulations. Export to the Belgian Congo of breeding stock and slaughter cattle, much desired by that country, is still prevented by the action of the Administration of Northern Rhodesia in forbidding their passage by rail, a matter of some dissatisfaction to our breeders. Export of breeding and slaughter stock into the Mozambique Company's territory is expanding, in spite of heavy mortality of bulls arriving there owing to redwater. Northern Rhodesia permits the introduction from Southern Rhodesia only of breeding stock, and imposes on this severe protective regulations which appear effectively to have prevented any such trade from being done.

The number of cattle exported from Southern Rhodesia during the year is as follows, for comparison the corresponding figures for last year being also given:—

Export of Cattle.	1918.	1919.
To the Union	12,153	27,520
To Portuguese East Africa	1,378	1,990
To East Africa	9,388	nil
To Belgian Congo	50	nil
To Northern Rhodesia	nil	nil
	22,969	29,510

The total export of cattle since the inception of the trade in the year 1916 now amounts to 77,999 head, of which 65,192 have gone to the Union. Of this latter number, the great majority have been cattle for immediate slaughter, but this year 4,787 breeding cows were also sent south, against 157 heifers brought up from the Union. We also sent to Portuguese East Africa 567 breeding animals. From now on the numbers of cattle exported, dead or alive, should rapidly increase.

The large numbers sent to the Union form a partial set-off against the constantly increasing importation of South African products and manufactures into Southern Rhodesia, amounting for the year to a sum of £838,271. This traffic continued to increase during the year, but has suffered at times from a serious want of cattle trucks. This unexpected shortage had a serious effect on the markets. In winter especially mobs of fat stock brought off their own pastures lose flesh rapidly whilst congregated at centres of despatch awaiting transport. The very long journey from Bulawayo to Johannesburg is in any case a severe trial to cattle, and there certainly appears to be justification for improved facilities for conveyance.

The increasing difficulty of obtaining pure-bred stock, forecasted last year, is being fully experienced. Higher prices, higher freights and the fact that cattle for Rhodesia are debarred from coming out in the same steamers as cattle for the Union, which have now to pass through the Pirbright Institution, have been followed by the natural consequences. The falling off is not so very great, but there is every reason why, instead of a diminution, there should have been a marked increase.

Cattle imported from the United Kingdom.

1917	99 bulls	100 females	199 total
1918	47 ,,	108 ,,	155 ,,
1919	52 ,,	86 ,,	138 ,,

As regards importation from the Union, the reduction in the numbers of female stock is most marked, and actually there was an excess of exports over imports of this class of stock, as 4,787 breeding cows were sent from here into the Union. Of course it is to be remembered that the exports consisted of common cattle, whereas the imports were of superior quality for stud breeding purposes; but this country is very far yet from being over-stocked. For the same reason, the practice of slaughtering heifers and cows is to be condemned.

The demand for bulls is clearly shewn by the increased numbers brought in from the Union.

Cattle imported from the Union of South Africa.

1917	239 bulls	2,527 females	2,766 total
1918	286 ,,	579 ,,	865 ,,
1919	493 ,,	158 ,,	651 ,,

During the year 219 new dipping tanks were built, as against 272 new ones in 1918. The number of dipping tanks in the country stands now at 1,582, which is rather more than one to every thousand head of cattle. It is still short of the number of occupied farms, the more so as this figure includes Government tanks and those on native reserves. The difficulty in obtaining cement has now been overcome.

Where other means fail, the cause of death of stock can frequently be determined through chemical examination. Of sixty-seven morbid specimens submitted to the Chemists during the year, death in twenty-five instances was definitely attributed to arsenic. In this way not only is the cause determined, but indication is given of what means to adopt to prevent further losses from such poisoning.

The brilliant success of the cattle from Rhodesia sent down to the Fat Stock Show at Johannesburg, in September, by Messrs. E. A. Hull, C. S. Jobling and C. C. Macarthur, was an event of far-reaching consequence, demonstrating as it did the potentialities of both Matabeleland and Mashonaland. These twenty animals secured five first prizes, three seconds and one third, one award being the championship for the best ox on the show. This achievement undoubtedly created a deep impression on the minds of many South African stockmen, and, besides reflecting credit on the exhibitors, it speaks more than volumes for the country where such a triple success can be achieved. This demonstration of the capabilities of our country was only equalled by the corresponding success of Rhodesian maize on the same occasion.

An important step forward in the history of our pastoral farming is marked by the commencement of active operations by the Rhodesia Meat Packing Company at Odzi, an enterprise conceived, financed and managed by the farmers of the country. The factory is capable of dealing at present with forty beasts daily, but the building is so constructed that at small expense this capacity can be doubled. For the present attention will be confined to preserving meat and producing by-products such as fertilisers, tallow, edible fats, neatsfoot oil and meat extract, but provision can be made for freezing beef when conditions warrant such treatment, and bacon curing could also be undertaken at very little additional expense. The company is registered with limited liability and a nominal capital of 100,000 shares of £1 each, of which 56,000 have been issued at 10s. per share, the balance to be paid either in stock or cash. The company is on a co-operative basis, any surplus profits beyond a restricted dividend being divided *pro rata* to the factory. A good beginning has been made, and the progress of this undertaking will be followed with close and sympathetic interest. The establishment of this factory by the farmers themselves is a striking proof of their confidence in the country. In this connection we find for the first time in the Customs annual returns of exports, under the heading "Meat," the figure 24,335 pounds in place of nil.

An interesting innovation in the usual methods of selling cattle in this country was initiated in April by the Farmers' Association of Plumtree, and has since proved a most complete success. The association constructed its own stock yards, dipping tank and watering troughs, appointed an auctioneer, and arranged a series of sales. The cattle are marked, cared for, and taken in charge for delivery by the society, and the fees compare favourably with those of other sales, yet the prime costs have been recovered, and future profits will be used for local public purposes. Other very important advantages are that the local cattle owners, including natives, soon acquire a true idea of the value of their cattle, removing illusions, and helping them to do sound business, whilst if dissatisfied with prices they can take the cattle back to their farms without serious loss. A similar scheme has also been adopted by the Sinoia Farmers' Association, and the plan is worth widespread imitation.

Prices for beef and mutton have ruled high, unduly so in the opinion of the consumer, in contrast to the price at which land and stock were acquired and the present cost of producing the animals. High prices of prime products are in some degree a revolving and mutual benefit, since they enable the farmer in time to pay the higher prices now demanded for manufactured goods by the merchant, and also to pay off his old-standing debts.

A development of the dairy industry has been the transfer of the Gwelo Creamery to a limited company from the fostering care of the British South Africa Company, which has carried it through its early and critical stages. At the start supplies did not warrant its existence, and profit was impossible; but the erection of the factory provided a sure market for cream, and enabled farmers to start dairying, and at the same time to get ready money returns to carry on their operations, thereby hastening the day that has now dawned when dairy farming and butter making on commercial lines is a firmly accomplished fact. There is still room for much larger production of butter and cheese.

Small Stock.—The numbers of sheep and goats owned by natives are very considerable, but those in the hands of Europeans have continued to dwindle during the past two seasons until now they amount only to 39,422 sheep and 17,639 goats. Only certain districts have proved suitable to small stock, and only in dry seasons, when cattle and crops suffer, does small stock appear to thrive.

Poultry.—The poultry industry has undoubtedly received great stimulus from the services of the recently appointed expert in these matters. During the year the industry has improved in a remarkable degree, as instanced by increased attention on the part of farmers to their poultry and larger numbers of persons turning attention to poultry farming as a profitable adjunct to ordinary farming or to their other occupations. This industry is as yet in its infancy, but is now being built up on proper lines. Poultry diseases are reported to be on the decrease, owing partly to inspection at the ports of entry, but mainly to the beneficial effect of their recent inclusion under the Animals Diseases Law, to the better knowledge of ailments and remedies and the more hygienic conditions in which birds are being kept. The high price of fowls and eggs leads to diminished demand, but corresponds to an increased cost of foodstuffs. A poultry station was established at Salisbury during the year for the purposes of demonstration and experiment and for holding egg laying competitions or tests, and a good beginning in this direction has been made.

This country is unquestionably most favourably situated for poultry raising, and the defects so far experienced have been due mostly to ignorance and carelessness, faults which can be remedied. Complaints of theft are numerous, and demand remedial action. The local demand is still too great to admit of export, but in time this too will no doubt be realised.

Vermin.—Rewards continue to be offered for the destruction of wild dogs. The losses they inflict might be considered ample inducement to destroy them, but their wide roving habits, sudden attack, and rapid disappearance render hunting a comparatively unsuccessful effort, and rewards are offered as a special inducement to persons not directly interested to destroy them.

Baboons also cause much damage and expense in watchers. The system of organised hunts to which the Government contributes the ammunition has been continued, twenty-six such meetings having taken place during the year, resulting in 1,148 baboons being accounted for, also 2,073 rounds of ball and shot ammunition.

Tsetse.—One of the gravest problems before us to-day undoubtedly and unfortunately is the presence of tsetse fly in certain parts of the country. For years past the fly belts have been observed and mapped, and it has become apparent that their limits in certain districts tend to alter, mainly in the direction of extending the respective areas, so as to re-occupy much of the territory infected many years ago, but free from the fly since the rinderpest in 1896. Marked retrogression of the fly has only been recorded in connection with areas where big game has been reduced to a minimum or the forest has been levelled. The danger attendant upon the presence of tsetse fly is two-fold—that of trypanosomiasis of domestic animals and of man, known in the latter case as sleeping sickness. Certain of the advances of the fly belts menace outlying farms, and moreover the presence of fly prevents the occupation and settlement of much otherwise desirable country. Some 10,000 square miles of the territory are affected at present, apart from areas threatened with invasion. Throughout tropical Africa efforts, more or less spasmodic, have been made to deal with this danger and to find a means of rendering habitable waste tracts now useless to humanity.

After careful consideration a policy has been embarked upon in Southern Rhodesia involving a yet closer study than hitherto of the habits of the tsetse fly, and also an attempt actually to cope with it and to try to prevent its spread. Such experiments hinge upon the supposed relationship between the fly and the larger mammals, on which there is evidence that tsetse is dependent for its food supply. A region favourably situated for such an experiment was selected. After the necessary study of the density and distribution of tsetse this area has, so far as possible, been cleared of all large warm-blooded animals—no fewer than twenty-seven sorts being included in the tally—and will for some time be kept as clear as possible in order to ascertain whether or how far the fly will be affected by the elimination of its usual food hosts. The area in question covers roughly 900 square miles, and includes a fly-infested salient jutting into fly-free areas and extending towards occupied country along the Bulawayo-Wankie railway line. The cost involved is considerable, but the issue at stake is also very material. Good progress has been made in carrying out the programme devised, and the work must be continued for some time, together with periodic examination, to ascertain what effect the process is having on the fly. No conclusions can yet be arrived at nor any deductions announced, but the indications so far are hopeful. If tangible results are shewn, this experiment will have far-reaching effects in the reclamation in Southern Rhodesia and throughout tropical Africa of very wide regions. Detailed records of operations are, of course, being preserved.

Yet another and quite separate experiment is in progress to ascertain the effect of removing evergreen trees from a fly belt, such foliage being known to be the harbour of the fly during the season when the rest of the native forest, being leafless and dry, affords no favourable cover. Here again it is as yet only possible to report progress, not to furnish premature reports.

The Mozambique Company's territory adjoining Southern Rhodesia on the east is largely infested also by tsetse fly, and the fringe of the belts invades the Melsetter district. This fact has been known for some years, and has been under observation by the Entomologist, and data regarding the occurrence of "nagana," the consequent disease of cattle, have been collected. Although, owing to natural conditions, the district is not threatened with wholesale invasion, the presence of the disease and the fly has a not unnaturally disturbing effect on the residents in the vicinity. Happily the Government of Mozambique territory is also alive to the matter, and has been investigating it, although, as elsewhere throughout the world, no effective remedial measures have as yet been discovered.

Pounds.—The pounds have increased from forty-one to forty-three; seven being established and five abolished. As the country is filling up there is more need of places where strayed stock may be kept and recovered by their proper owners, but it is frequently difficult to find persons disposed to take up the task of poundmaster.

Brands.—The number of registered brands has been brought up from 6,768 to 7,177. Natives, especially in Matabeleland, continue to register brands fairly freely.

Agricultural Union.—The Sixteenth Annual Congress of the Rhodesia Agricultural Union was held in Salisbury in March, when current subjects of interest were ventilated and expression given to the views of delegates on a wide variety of matters. It is difficult to overestimate the importance of these discussions, which are often of a high order, and their helpfulness to the Government in obtaining the views of the farming community. This Union of agricultural associations is now numerically strong, and it is an active, useful and representative body.

Cattle Breeders' Association.—The formation of a cattle owners' association of Rhodesia is an event of importance marking a tendency towards co-operation in mutual interests which is highly to be commended. The primary objects are to promote and safeguard the cattle industry and to bring together all who have the common interest of raising cattle in Rhodesia.

Maize Breeders' Association.—Similarly the formation of a maize breeders' association marks an important step in the organisation of our grain producers. It has already proved its usefulness by revising the maize prize lists for our shows, by taking steps to encourage the production of superior maize seed, and by assisting the agricultural branch in devising further experiments connected with maize growing. The association has for its sole object the encouragement of the maize growing industry, and is deserving of the support of every arable farmer in Rhodesia. The maize growing industry has reached a stage when the creation of such an association is a necessity, and the guidance and assistance which a corporate body of this kind will be able to give will have a marked effect on the quality of our maize and on the development of markets.

The existence of these two bodies, with the Rhodesian Tobacco Growers' Society already of some years' standing, and the three poultry societies, indicates a tendency towards combination of producers which is all to the good and in conformity with the spirit of the age.

Shows.—The agricultural shows continue to demonstrate not only the capabilities of the country, but now more and more also the achievements and the rapid progress that is taking place. These occasions are of very great instructional value, and are well supported both by exhibitors and the public.

Labour.—One result of the excellence of last season's harvest has been the large number of beer drinks amongst the natives. Notoriously improvident, no provision is made for lean years, and whilst the times are good they prefer to remain in idleness. Local labour has thus been extremely scarce, and that from beyond our borders has also been none too plentiful. The development of the country is much retarded by the slothful contentment of the native, unimpeachable from his standpoint, but none the less harmful to the country at large.

It may be hoped that the institution of a system of industrial training now being initiated by the Government may by direct instruction of pupils and by the indirect but potent influence of example have far-reaching beneficial effects on the native mind in this respect, awakening ambition and supplying from the most natural source, the local population, the industrial workers of the future.

Legislation.—Although no legislation of an agricultural character was passed at the last session of the Legislative Council, yet several debates of importance to this industry took place, notably those dealing with technical education of natives, appointment of a Trades Commissioner, noxious weeds, tsetse fly, afforestation, grain elevators, cattle export, land and labour.

The administration of the various Ordinances entrusted to this Department was conducted throughout the year without incident.

Statistics.—The work of the Statistician is proving most useful, and information is being disseminated as regards crops, their extent, total production, yields in different districts, forecasts of returns and of exportable surplus, and comparisons over periods of years. In connection with live stock we now know how many we have, their rate of increase, distribution, export, breeds and numbers of each breed, and can form estimates of future expansion. The data collected enable us to know precisely and without self-illusionment our position amongst the producing countries of the world and our rate of progress; happily we have no occasion to be ashamed of either, and can furnish enquirers with definite figures and facts. To new settlers, to commercial businesses, to other Governments and to ourselves such information is proving most valuable, and it is pleasing to note that the task of collecting these statistics is receiving the cordial support and assistance of the farming community.

Crops.—The season was fairly good, as shewn in the all-round improvement in yield per acre, but it was not without its drawbacks. The scarcity of labour was very generally felt, and was aggravated at sowing time by the influenza epidemic. Abnormally heavy rain later on in the season, scouring the surface of cultivated land, also served to diminish returns which, but for these untoward circumstances, would have been exceptionally good. The advent of the "side crop" and the introduction of the rotation in arable farm practice is making slow but sure progress as experiments and demonstrations shew the wisdom of such a course.

Of the area cultivated by Europeans, 15.6 per cent. was sown to crops other than maize, and of all these, with the notable exception of tobacco, it may be said that they shewed a diminution in extent corresponding to that in the case of maize, but also an increased return per acre.

The following tabular statement of the principal crops indicates their relative position at a glance:—

Crops.	Acres.	Yield per acre.
Maize for grain	173,313	5.13 bags
Maize for silage	5,619	2.3 tons
Wheat	4,394	3 bags
Tobacco	4,197	350 lbs.
Pumpkins	2,325	1.9 tons
Beans	2,155	1.4 bags
Cattle melons (majordas)	1,895	2.6 tons
Ground nuts	1,706	6.2 bags
Potatoes	1,601	21.7 bags
Oats	1,485	—
Teff	1,120	—
Napier fodder	972	—
All other crops	9,647	—
	210,429	

Maize, our principal crop, shews, according to statistics, an advance over last year in yield per acre. This is due to a more favourable season, resulting in a larger total production in spite of a decrease in acreage. The effects of the war, lack of labour, high cost of implements, absence of farmers on active service, coupled with influenza just at planting time last year, have all contributed to check cultivation and actually rendered the acreage planted to maize last season the lowest in four years. Happily the area planted for the 1919-20 crop indicates a recovery, approximately 177,470 acres being well got in, and promising another good harvest next year.

Owing to the good season, and in spite of the shrinkage in area, the total maize crop for the year was ahead of the previous one by about 300,000 bags, the actual figures being 889,969 bags off 173,313 acres, averaging 5.13 bags of 203 lbs. per acre. Shipping began to be more plentiful than in the past, and the surplus still under Government control, amounting to 406,712 bags, was exported with much less difficulty than previously. The quality of the grain was all that could be desired: indeed, in this Rhodesia is pre-eminent, and the fact deserves wide publicity, in order that full recognition can be obtained in the form most acceptable to growers and most likely to induce them to maintain this position—prices. The imports of maize and its equivalent in maize meal represented 4,931 bags, and reduce the net export to 401,781 bags.

A number of farmers undertook, on the urgent recommendations of the Assistant Agriculturist, Mr. Mainwaring, to send exhibits of maize to the Witwatersrand September Show, with the result that they achieved a sweeping victory there, greatly impressing all who saw or heard of it. His claims as regards the quality of Rhodesian maize were amply borne out by the striking success attained. The consequences are far-reaching and beneficial to the farmers who sent entries, to their districts and to the country at large. A great fillip has thus been given to the production of maize of high quality, which must re-act on the whole crop as better seed is sought out and used and the average standard improved.

Cultural methods are steadily improving, and attention is now beginning to be given to systematic preventive measures against insect attack, undertaken mainly by the process of poison-baiting prior to planting, a refinement in the culture of maize which, though now of proved efficacy, would a very few years ago have been regarded with derision.

Maize Grading.—With the return towards normal conditions of trade and the possibility of export, renewed interest was shewn in the grading of grain for export. This system has now become thoroughly established, and its utility is recognised, although this is likely to be the case much more when differentiation in price is made between the top and the second grades, which, owing to war conditions, has not of late years prevailed. Not only have all exporters acquiesced and indeed supported the compulsory examination and grading of their grain, but they have voluntarily sought to have meal also inspected with a view to facilitating export. This duty has been undertaken by the graders in the interest of the growers. The quality of the grain generally was high, and 393,000 bags of maize and 34,000 bags of meal were graded for export, representing about 48 per cent. of the total crop.

The control of the export of grain as regards quantity, originally initiated as a war measure to ensure adequate supplies being retained in the country, has been continued under the High Commissioner's Proclamation No. 48 of 1914 controlling the exportation of foodstuffs, and this has prevented speculation and excessive export.

Elevators.—Before leaving the topic of maize, it may be mentioned that opportunity was taken of the presence in South Africa of an expert of the highest eminence who was reporting to the Union Government on the question of the bulk handling of grain to secure advice on the question of grain elevators for Rhodesia. The subject is one of prime importance both to this Territory and to the Mozambique province, and it is hoped that his recommendations when received may lead to improvements in our present crude and uneconomical methods. In view of the heavy capital outlay involved, the matter will no doubt receive careful and probably prolonged consideration, but it would be a thousand pities if it does not materialise at the earliest moment that financial considerations will allow.

Wheat.—The wheat imported into this country, less exports, and expressing flour in terms of grain, is 25,324 bags, and the local production last season was 13,432 bags. In the past the lack of mills to grind Rhodesian-grown wheat was a serious hindrance to increased production, but this has now been overcome by the opening of flour mills at Gwelo and Salisbury, thus ensuring a ready sale at prices always naturally protected by the distance from foreign sources of supply, the Cape, Australia or South America. We now produce one-third of our requirement and double the quantity grown five years ago, so that the position is decidedly improving.

Tobacco.—The decision of the British Government to grant a tariff preference of one penny on every ounce of tobacco from within the Empire is of paramount importance to the interest of that crop, and will undoubtedly promote cultivation here even though the full benefit may not reach the actual grower. This preference gives us a very considerable advantage over American imports, and, since tobacco comparing very favourably with that of Virginia can be grown in Rhodesia, it is only reasonable to suppose that manufacturers in the United Kingdom will be very ready to take all the leaf of suitable quality we can send. Owing to the date of this notification it must be some time before the full effect of this benefit can be felt. Tobacco yielded much better crops than last year, and the quality was also better, though early frosts caused damage in some districts.

The state of the tobacco industry in Southern Rhodesia is most satisfactory and very gratifying, in view of the early struggles and ups and downs experienced by growers in former years. The present position, contrasted with that of last year, is summarised in the following tabular statement:—

Virginian Tobacco—

	1917-18.	1918-19.	Increase.
Area planted ...	2,434 acres	3,198 acres	764 acres
Total yield ...	415,210 lbs.	1,179,932 lbs.	764,722 lbs.
Average yield ...	171 lbs.	369 lbs.	198 lbs.

Turkish Tobacco—

Area planted ...	813 acres	999 acres	186 acres
Total yield ...	204,961 lbs.	287,680 lbs.	82,719 lbs.
Average yield ...	219 lbs.	280 lbs.	61 lbs.

A favourable season, increasing knowledge and the benefit of the services of the expert adviser are traceable in the position now attained, on which he reports as follows:—

> "With the increase in yield there was also corresponding improvement in quality. The 1918-1919 crop of tobacco was grown under more favourable climatic conditions, the fields were better cultivated, fertiliser of better grades was generally used, and curing was more carefully carried out. The generally improved conditions resulted in the production of leaf of improved quality, which realised higher prices than for the 1917-1918 crop, with correspondingly greater profits for the producer.
>
> "The production of Turkish tobacco has grown into an important branch of tobacco culture in this Territory. The South African demand for Rhodesian-grown Turkish tobacco is increasing, and this type of leaf has also found a ready sale on the London market.
>
> "In this Territory there are large areas of soil suitable for the production of both Virginia and Turkish tobacco. There is also sufficient labour to handle a greatly increased acreage, provided the labour is properly organised and paid adequate wages. In the past the lack of markets has kept the tobacco industry from making normal progress. The contract system of supplying the local markets has stabilised the South African markets, and the Imperial preference has practically assured the grower

> of a market for his surplus tobacco if exported to the United Kingdom. Under these circumstances it is reasonable to suppose that there should be a rapid expansion of the industry, which can be made the means of support for a considerable increase in the white population of Southern Rhodesia."

The society which controls the tobacco market in the interests of the growers has by agreements ensured a steady sale at remunerative prices for the leaf of its members for a period of three years, thus giving the necessary security and encouragement to ensure rapid extension on sound lines.

Cotton.—Experiments in cotton growing have been entered upon after careful consideration of climatic, telluric and industrial conditions. This season ninety-one farmers have undertaken trials in twelve districts, and over one thousand acres, on a scale that is to warrant some fair conclusions being reached, and there is every reason to anticipate a good measure of success. The cotton exhibited at the Salisbury Agricultural Show aroused much attention, and the prizes offered next year by the British Cotton Growers' Association should ensure a thorough trial of this crop, which if successful will prove a great boon to our farmers as well as to the Mother Country.

Citrus Fruits.—The citrus industry, according to the reports of our expert, shews a highly satisfactory increase in importance. Citrus trees of all kinds in bearing have increased during the year from 57,211 to 67,668, and the total from 147,220 to 151,747. The prospects of an important overseas trade in oranges are promising. In this case it is possible approximately to forecast the future, since it takes some time for trees planted to bear fruit, and meantime their growth can be gauged and the probable crops estimated. This year some 5,000 boxes or 200 tons were exported to Europe, besides considerable quantities sent to local and Union markets. The forecast for the next few years, based on the known data, assuming no devastating calamity occurs and that freight is available, is as under:—

1920	10,000 boxes	400 tons or	555 cubic tons
1921	25,000	1,000	1,390
1922	60,000	2,400	3,300
1923	100,000	4,000	5,550
1924	129,000	5,000	6,950
1925	200,000	8,000	11,120
1926	300,000	12,000	16,680
1927	500,000	20,000	27,800
1928	600,000	24,000	33,360
1929	800,000	32,000	44,480
1930	1,000,000	40,000	55,600

There are good grounds to anticipate further rapid extension of citrus orchards when export becomes established, so that even this tenfold expansion in ten years may be exceeded. For many reasons it is desirable that shipment should take place through the port of Beira if adequate facilities can be provided there. Reports on Rhodesian oranges sent to London are most encouraging; these are favourably compared to others sent to the same markets. As yet our export of oranges has been entirely from the orchards of the British South Africa Company, which has throughout been the pioneer of this industry, but other growers should be in a position to commence shipping in the year 1920.

Fertilisers.—Artificial fertilisers, which were almost unobtainable during the war, are now procurable, but at much inflated prices. so that their use is only exceptionally warranted. In a measure they have been replaced by the use of wood ashes collected at mine furnaces and by lime, but especially by bat guano. This valuable article has been found in several parts of the country, and a company has been formed for the exploitation of extensive deposits to the north-west of Gatooma. In regard to bat guanos found in Rhodesia, the Agricultural Chemist reports:—

> "The extent of these deposits can safely be placed at many thousands of tons, but it is impossible to estimate the actual quantity with any degree of accuracy owing to the irregular nature of the caves. In common with bat guanos occurring in the Union and other parts of the world, the material varies very greatly in composition, some being so inferior as to possess little or no commercial value; much of it is, however, of considerable fertilising value, and should be in demand if made up to approved formulæ and sold at prices which are relatively cheaper than other fertilisers, and allow a profit in use by the farmer."

In contradiction of popular beliefs, lime is by no means scarce in the country, and during the year the Chemist records that deposits suitable for cyaniding, building and agricultural purposes have been located in the districts of Salisbury. Gwelo, Bulawayo, Mazoe and Lomagundi, and deposits of fair quality in Gwanda, Wankie, Insiza and Bulalima.

Forestry.—The forest nursery, Salisbury, has continued to supply trees and shrubs to the public, and this work is finding increasing appreciation by the public. Demands from Matabeleland are now met from the nursery at the Rhodes Matopos Park. thereby saving purchasers much railage, and supplying them with plants raised nearer to the locality in which they are to grow. From the former station 109,200 trees and shrubs have been despatched, and from the latter 6,344 have been issued. Several individuals, as well as the Municipality of Salisbury, are now establishing plantations on a considerable scale.

The proper control of our natural forest wealth, the exploitation of our native forests on scientific lines, and the encouragement of tree planting where circumstances justify or admit, have long been recognised as essential subjects for attention. Only the war has prevented active steps being taken. Arrangements have now been made for the appointment of a competent expert to make a study of the existing forest wealth of the country, with a view to its conservation, utilisation and extension. The establishment of plantations to provide simultaneously timber, shelter and ornament has been commenced by the Municipality of Salisbury, a practical demonstration on a large scale which is likely to exert much direct and indirect benefit.

Irrigation.—The activities of the Agricultural Engineers during the last few years have resulted in some 30,000 acres of land being recorded, after due survey and examination, as suitable for irrigation. From these investigations it seems likely that within the occupied parts of the country there will be but little more irrigable land found unless resort is had to storage schemes. In the more remote and undeveloped regions, such as the Sabi Valley and in the extreme south-east and north-east of the country, it is not only possible but likely that irrigable areas of importance may yet be discovered, but the demands nearer the populous centres have so far fully engaged the attention of the available staff. There is also room within the irrigable areas already examined for much development, more than half not yet having been turned to account. The Agricultural Engineer truly observes:—"While, therefore, the cry is continually heard that all good land near the existing railways has been taken up, and for new development the settler must go further afield, the fact is often overlooked that the good lands in the developed areas are capable under irrigation of considerably more intensive working and supporting considerably larger populations."

A number of schemes prepared by the Agricultural Engineer are in course of being carried out, particularly along the Mazoe Valley, where also the great dam erected by the British South Africa Company has been completed, itself providing water for 6,000 acres of land, one-fifth of all that we have as yet determined. Development of 700 acres of irrigable ground on the Umtali River is unfortunately held in abeyance for lack of the necessary funds, some £3,000 or so, which is much to be regretted, especially as the Water Ordinance supplies machinery for this purpose.

The administration of the Water Ordinance has proceeded, forty-three applications for definition of water rights having been dealt with. A Water Court was held during the year at Umtali and Salisbury.

Meteorological work has received increased attention during the year and preparations formed for the inauguration of hydrographic investigation on a systematic plan next season, a subject very urgently needing attention, in view of the steady development of irrigation and the apportionment of available supplies amongst applicants.

Departmental.—A department of Government entrusted with agricultural affairs must include within its purview a considerable number of allied but very distinct administrative and technical subjects. These branches vary in magnitude, but all are requisite, and from time to time fresh sub-division is called for as greater specialisation becomes necessary. The duties of the scientific officers are primarily research and instruction, but to some extent administrative, as in the case of irrigation, orchards and nursery inspection or maize grading. The staff of the Department resumed during the year its normal establishment after the absence of many members on active service and the necessary suspension of fresh appointments throughout the war. Subject to recurrent interruptions through leave and to changes due to growth and normal development, the personnel of the Department is now framed on the basis indicated below. This is given in detail in order to shew the scope of the work carried on and the various activities of the Department of Agriculture.

The Director of Agriculture, through the Secretary of the Department, exercises general supervision and responsibility.

The function of the secretarial staff is executive and administrative, and is closely associated with every branch. Apart from the clerical staff, which numbers fifteen, of whom several are devoted entirely to one or other specific subject, there are eleven branches pursuing separate subjects, but all in harmonious co-ordination and mutually helpful.

Relatively to the present number of farmers, the strength of the Department on its scientific side may seem great, but a new country needs technical men even more than does an older one, and results have already, it is claimed, fully justified the policy pursued.

The *Agricultural Journal*, with which is combined the library and the issue of bulletins, brings to a focus the information collected through research or prepared for general instruction, radiates it out again to the public specially concerned, and preserves it for future reference in readily available form.

The statistical office compiles returns of the utmost practical value alike to growers, merchants, exporters and to the Government, which has to assist and guide them.

The agricultural branch, dealing with crops, cultural and botanical subjects generally, comprises three advisory officers, three assistants on experiment farms and four graders (part time).

The Agricultural Engineer's branch includes three technical officers, and occupies the time of two of the clerical staff on the compilation of meteorological returns.

Chemistry commands the time of three qualified officers, with clerical assistance.

Two Entomologists cannot cope with all that requires to be done in that branch, and further help is meditated to enable the tsetse fly problem to be dealt with.

Forestry as a new branch is being placed under a sylvicultural expert from the Union of South Africa.

Tobacco and cotton, hitherto provided for by one expert, will shortly have the services of another.

Citrus and fruit is a separate subject; similarly dairy, poultry, the *Agricultural Journal* and statistics are each treated as separate branches of the work, though one officer only is concerned in each subject, five in all.

This summary indicates the lines along which the Department of Agriculture can assist the farmers of the country, and if omissions and inadequacies are observed—and their existence is fully realised—the facts of the position as regards the size of our farming population and the financial conditions of the country must also be remembered. Expenditure of larger sums would be easy; it is the judicious distribution to the best advantage of the amount available that demands care.

Such being the present organisation, it may be well to indicate here that as the country advances there will be need of expansion, and as the rising generation come on, education in agriculture will have to be provided. The accommodation available both for offices and laboratories is not conducive to the best results, and better equipment would secure better output.

The technical members of the Department are constantly travelling about the country visiting individual farms, attending meetings, giving instruction and advice by word of mouth in addition to correspondence and publications. In this way intimate touch is maintained between the actual farmer and the Government. The demand for such services is never-ending, and grows from year to year. Personal attention is costly, yet the results justify the system as against the alternative of propaganda by paper through the press, bulletins and letters, though these, as auxiliaries, are by no means to be ignored.

These officers during the year attended 102 meetings of various descriptions for the purpose of giving lectures, demonstrations or taking part in discussion, whilst a very great number of individual visits were paid to farmers at their homes. A successful "farmers' day" was organised at the Salisbury Show, when demonstrations and lectures were given based on the various exhibits, and well supported by the public. Also at Gwelo a series of lectures lasting over three days was arranged by the local farmers' associations, and a very large and interested attendance testified to the success of the undertaking.

Agricultural experimental research, which had perforce been in partial abeyance owing to the war, has now been resumed with full vigour. Progress in experiments has also been made in regard to rotations, fibre crops, fodder crops, artificial pastures, wheat and other cereals, the introduction of new crops, and botanical studies as far as time and staff permit. Details of these researches are readily available to all interested, and reiteration of the lessons learnt is always necessary to spread abroad the knowledge collected.

At the two experiment stations at Gwebi and Salisbury investigations are continued according to programme, and the results made public and turned to account. Public interest in these institutions is growing, and their work is now bearing fruit.

The crop experiments at the Government experiment farm, Gwebi, have been continued with success. Harvests fluctuate according to the season, but on the whole the object aimed at on the Gwebi farm is being achieved, viz., the application on a practical scale, and under ordinary farming conditions, of the lessons taught or the indications given by the small plots under more artificial conditions at the experimental station at Salisbury. The Gwebi farm suffers, however, from one-sided development, crops without stock being an anomalous state of affairs, whilst its equipment, arrested in its early stages and not since resumed, renders it far from being the instructive model or the up-to-date institution that a Government farm of this nature should be. The fattening of cattle in winter in pens or kraals on foodstuffs specially grown for them and on the waste or inferior grain produced on arable farms is a process now being adopted in certain districts. A series of experiments has been in progress at the Gwebi farm during several years past to ascertain the best cattle fattening methods to follow in this country; and these experiments have now reached a considerable degree of completeness, the trials this year giving very satisfactory results, which have been published and made accessible to all interested. These important and somewhat complex investigations are being continued.

It becomes ever more apparent that the want of a stud herd of cattle on the farm is a great drawback, both as a source of supply of high-class bulls—so very much wanted—and as a means of turning to account the foodstuffs produced. Without cattle and pigs the practical and instructional usefulness of the farm is much diminished. No improvements as regards the dilapidated buildings and equipment nor live stock were effected, and the work continues as in past years to be carried on under very unfavourable conditions.

The costs and proceeds of the Gwebi farm to the nearest pound were as follows:—

Receipts.		Expenditure.	
Produce sold and issued free	£310	Salaries	£638
Produce in hand on 31-12-19 for sale*	1,139	Expenses (not audited) ...	1,325
Produce issued to Government institution	475	Difference on valuation of live stock	132
Sales of live stock	104		
	£2,028		£2,095

It has not yet been found possible to establish an experiment station for the benefit of the farmers on the sand veld, though the need of such an establishment has long been recognised.

The chemistry branch has been kept busy with questions relating to soil fertility, the nature and choice of fertilisers, the nutritive value of feeding stuffs, control of dipping fluids, poisoning of stock, examination of saline deposits, limestone, minerals, water and milk, and of maize for moisture. The number of analyses carried out was 1,686, of which 1,501 were dips, 37 fertilisers, 27 soils, 76 toxicological specimens, 8 limestones and the remainder miscellaneous. The numerous requests for information and advice leave little leisure for that chemical research work which is so desirable in a young country teeming with unsolved problems.

The Entomologist has continued with marked success his studies of the various insect pests afflicting our crops. Those affecting maize have received particular attention, and it has been fully demonstrated that the returns of this crop can be materially enhanced by the adoption of certain measures, by no means difficult or impracticable, which ought to become as regular and customary as, say, hoeing or cultivating. It remains to popularise the practice of baiting the land prior to planting, and the treatment has really only to be known and appreciated in order to be adopted.

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* Since sold.

Insects attacking tobacco, beans, pumpkins and citrus fruits have also been the subject of investigation. Tsetse fly, referred to elsewhere, has of course been one of the principal matters, whilst routine duties have also been conducted in connection with the Orchards Inspection Ordinance, the Nurseries Ordinance and the Importation of Plants Ordinance. At our agricultural shows the instructive exhibit of economic insects always attracts attention, and furnishes useful instruction besides calling attention to what is being done for the protection of farmers in this way.

The work of the entomological branch forms a striking instance of the value of applied science to the agricultural and pastoral industries —direct benefit being conferred in countless material ways.

The Tobacco and Cotton Expert has been more than fully occupied in visiting farms and giving instruction and advice, in helping the Rhodesian Tobacco Co-operative Society in handling and disposing of leaf, and in initiating comprehensive experiments in cotton growing in such regions as appear suitable for this crop.

The officers concerned with irrigation, poultry and horticulture have been constantly moving about the country giving advice and help, and pushing forward by every possible means the development of the country.

The usefulness of the statistical office is becoming more and more apparent, and the information collected becomes more valuable as the particulars extend over more years, and the rate of our progress, as well as our actual position, can at any moment be gauged.

The resignation of the Dairy Expert, Mr. J. B. Fisher, in order to take up farming in the country, before there had been time for his servives to have much visible effect, was a loss to the Department, which, however, has fortunately been made good by another appointment, making but a short break in the continuity of the work. The main loss lies in the fact that a new officer necessarily takes some time to acquire knowledge of local conditions.

It is a pleasure to record the safe return of so many members of the Department, and to acknowledge the ungrudging services and liberal interpretation of their duty shewn by those who have been carrying on the work until the return of the others. Public recompense is not to be looked for, and the appreciation of colleagues who know the facts must be their best reward.

Cream and its Production.

By T. Hamilton, Dairy Expert.

As the dairy industry in Rhodesia develops, the lack of urban population will make us look for markets overseas. There is no demand for inferior produce in Europe. Competition will soon again become keen as Denmark and Holland recover from the wastage caused by lack of cattle food during the war. Australia and New Zealand will make strenuous efforts to keep the lead they have won for themselves. The Union will be in a position to export and all our endeavours should be to produce an article equal in quality if not superior to that produced by the countries mentioned.

If we follow Queensland's example we must endeavour to develop the butter industry. There is always a demand for good butter, but it must be properly made and stored. To make farm butter for export is almost a physical impossibility, as, for a greater part of the year—and this during the time that milk is most plentiful—it is almost impossible to control temperatures sufficiently on the farm to enable a good product to be turned out. If this can be done the butter cannot be stored at sufficiently low temperatures to enable it to arrive at the coast in good condition.

The great development of the margarine industry during and since the war has almost killed the demand for inferior butter, and unless the butter can arrive in England showing "briskness" of flavour it will be a drug on the market. No butter maker can make good butter from bad cream, and it lies almost entirely with the farmer whether the cream is to be first or any other grade. In Rhodesia, where distances are great and communication slow, the farmer and cream supplier has a great deal to contend with; but this is all the more reason why he should make every endeavour himself to ensure his cream arriving at the creamery in first grade condition.

The very first principle on which successful cream production depends is cleanliness at milking time. Before milking is commenced the udders and flanks of the cows should be washed. On most South African farms this is neglected, and during wet weather the udders and flanks are simply covered with encrusted filth and mud. Some of this is bound to drop into the milk and cause gassy and yeasty fermentations in the cream. The kraals, cow stables, sheds, etc., should be thoroughly cleansed. The system of milking in dry dusty kraals cannot be too severely condemned. This system is the cause of a great deal of cream being second grade quality, and until some better and more sanitary methods of milking are adopted, there cannot be much hope of Rhodesia ever being able to produce a first grade article.

Where the practice of shedding is impossible, it is advisable to tie up the cows at milking time. An inexpensive manger can be constructed, and if a thatched roof over all can be constructed so much the better. Feed flavours, due to the use of ensilage and other rank smelling feeds, can be obviated by the practice of giving the cows their feed after milking is completed.

The milker must be clean in his habits and his dress. Many natives cannot milk without dipping their hands into the milk bucket. This practice should not be tolerated, as it leads to badly tainted milk and cream. The utensils should always be washed with warm water and afterwards scalded and then hung up in some convenient place, from which they should not be removed until the next milking time comes along, when they should be re-washed and scalded. Milk buckets should not be used for any other purpose. Attention to these details should ensure a reasonably clean milk being produced, from which a good flavoured cream can be expected.

Separation.—The principle of cream separation depends on the development of centrifugal force, which is developed to such an extent in the ordinary separator that it is 2,000 times greater than the force of gravity. Thus work which is done in one minute would, by the aid of gravity alone, be imperfectly performed in several hours. The law governing centrifugal force is that it increases as the square of the number of revolutions. Thus if one bowl revolves twice as fast as another the centrifugal force is four times greater. For this reason it is essential to keep an eye on the speed at which the separator works, as variation in speed results in proportionately greater variation in the work performed by the separator. Machines are designed to run at a certain speed, and this speed should not be exceeded.

The chief points to be considered in separation are as follows:—

(1) Solidarity of the foundation and efficient working of the separator.
(2) The condition of the milk.
(3) The speed of the separator and the inflow of milk.
(4) The use of water and skim milk before and after separation.
(5) Alteration of cream screw.
(6) Thickness of cream.
(7) The cleaning of the separator.

(1) *Solidarity of Foundation and Efficiency of Separator.*—It is absolutely essential that the separator should be mounted on a stable solid base, and that it should be absolutely level. It is very little use to guess whether it is level or not. A carpenter's level should be used when setting up the machine. Any tendency to vibrate will prevent efficient separation.

(2) *Condition and Temperature of Milk.*—Milk should be separated when warm and fresh. On no account should it be separated when below 85° F., as it sometimes is on a cold gusty day. If it does become as cold as this it will be necessary to warm it to at least 90° or 95° F. (It is always as well to take the temperature whilst separating, as the variation in temperature of the milk often means a variation in the cream test.) It is very unusual to leave the evening's milk over for separation next morning, but if such does occur, the evening's milk should be heated slowly, as acidity has already developed and the milk is more viscous, and if mixed with the morning's milk, each should be of the same temperature. Before being put through the separator the milk must of course be strained.

(3) *Speed of Separator.*—The speed is generally indicated on the directions enclosed with the machine, and should be maintained uniformly throughout. Variation in the speed of the separator means variation in the cream test. Often enough the native turning the machine becomes tired and unconsciously slackens off. His rate of turning, therefore, should be periodically watched and checked.

(4) *The Use of Water and Skim Milk.*—It is a good practice to run warm water through the machine before milk is put through; this lessens the vibration and tends to more perfect separation. After completing the separation of the milk, a bucket full of separated milk should be passed through the separator, and then a bucket full of warm water to cleanse the bowl.

(5) *Alteration of Cream Screw.*—To control the thickness of the cream it is usual for most separators to be fitted with a cream screw. A slight turn towards the centre of the machine will cause the aperture to close and a thicker cream to be obtained. If fitted with any other device to control the thickness of the cream the directions enclosed with the separator should be studied.

(6) *The Thickness of the Cream.*—A heavy-bodied cream is recommended, varying from 45 per cent. to 55 per cent. This carries better, as there is less serum to cause fermentation whilst the cream is in transit to the creamery. The separator should therefore be adjusted to this end.

(7) *Cleaning the Separator.*—The separator should be taken down after being flushed with warm water. The parts should be washed in warm water and scrubbed with a brush. Afterwards they should be scalded and put in a safe place covered with a clean dry cloth.

Treatment of Cream.—After separating it is important that the cream should be cooled as rapidly as possible. This may be done either by running the cream directly over a cooler through which cold water is circulating, or by standing the vessel containing the cream in a trough through which cold water is flowing, stirring it frequently in the meantime to reduce the temperature quickly. When the cream has been cooled, it can be transferred to another receptacle. Three receptacles are necessary: one in which the cream is received from the separator and in which it is cooled; a second in which the cooled cream is placed; and a third, the cream can, in which it is despatched to the creamery. This cooling process should be carried out every time the cream is separated, and on no account should warm cream be mixed with cream already cooled. Both should be of the same temperature before being mixed. When mixing creams of varying ripeness they should be well stirred together.

The cream supplier should never forget that when his cream is received at the creamery it is carefully stirred before being graded. Often enough cream is received the top layer of which has a good appearance and flavour, but when the whole can is stirred it is found that a bitter or a fermented flavour is present. It is only too evident that the supplier has disregarded the first principles of cream treatment and has separated directly into the can. This is a fatal mistake, and no cream handled in this way can be regarded as first grade.

Every supplier should possess a wide mouthed ripening vessel from which the cream can be transferred to the cream-can proper before being sent to the creamery. This ripening can should be kept in the coolest possible place, covered with butter muslin and never closed, away from all contamination either by flies or smells. Whilst in the ripening can the cream should be frequently stirred. A cool dairy is a *sine qua non*, and should preferably be built with double walls and a thick thatched roof. One often finds cream in harness rooms, in rooms where bacon is hanging or where vegetables are stored. This of course is wrong, and under such conditions as these no good results can be obtained.

Despatch of Cream to the Creamery.—Cream should be despatched as often as possible. In many parts of Natal where the railway service is good it is sent to the creamery every day and the proportion of second grade cream under such conditions is extraordinarily small. Three times a week in summer is by no means too often to send cream away. To hold up cream four days in hot weather must have a deteriorating effect on its flavour and condition, and it must invariably be second grade by the time it arrives at the creamery.

Whilst in transit to the creamery see that the cream is protected from the direct rays of the sun, otherwise a first grade cream can easily become a second grade cream before arriving at its destination.

SUMMARY.

To obtain a First Grade Cream:—

(1) Observe every precaution to ensure the production of clean milk.

(2) See that the separator is properly mounted and is properly manipulated.

(3) After using the separator, take out the working parts, wash them in warm water, using a brush, and then scald in boiling water. Never assemble the parts until immediately before use.

(4) Always use three receptacles when handling cream. The first for receiving the cream from the separator, the second the ripening can, and the third the cream can proper. See that these cans are always washed and then scalded before cream is put into them.

(5) Always cool the cream after separation is completed.

(6) Never mix warm cream with cool cream.

(7) Keep the cream in an open can covered with clean butter muslin, and keep it as cool as possible, standing it in a tub of water or in a running stream if possible.

(8) Stir the cream at least three times a day.

(9) Protect the can from the direct rays of the sun whilst it is in transit to the creamery.

(10) Adjust your separator so as to get a cream varying from 45 to 55 per cent. butterfat. A heavy-bodied cream carries better than a thin cream.

If your cream test varies slightly from time to time, do not think that the creamery is trying to cheat you. The variations in the butterfat test in the milk (and these are very great), the variations in temperature in the milk when separated, the want of uniformity in the speed of turning the separator, and the variation in the amount of skim milk or warm water passed through the separator for cleansing purposes, all these cause variation in the cream test.

Measurement of Land.

SIMPLE METHODS OF ESTIMATING THE SIZE OF CULTIVATED FIELDS.

By F. Eyles, F.L.S., F.S.S., Statistician.

There are several reasons why it is important that farmers should measure as accurately as convenient the fields they put under crops. A few men may be indifferent as to the amount of land they work and its yield per acre of the crop grown, but generally speaking neighbours like to compare results, and districts vie with each other in healthy competition for the highest yields. It is worth noting also that the value of arable land in a district is largely influenced by the records of average productivity. Now the value of all such figures and comparisons depends upon their reliability, and estimates that are purely guess work are not reliable. It is thought that while many farmers make a rule of measuring their lands, there are others who either cannot or at any rate do not do so. It is obvious that if any appreciable proportion of farmers fail to ascertain the area of their cultivated land, then it is impossible for them to fill up correctly the crop returns annually required by this Department, and it follows that the actual position of Rhodesia as a producing country cannot be truly ascertained.

In order to shew how simple the measurement of land really is, a table is given here for certain arbitrarily selected acreages, which will also serve as a guide for other areas and even for irregularly shaped fields. The table is based on the assumption that a man pacing out ground steps one yard at a time, and it is not difficult with a little practice to train oneself to do this with fair regularity. The table is drawn up for rectangular fields, that is fields having the same width throughout their length, and though this seldom applies except in flat open country it can be shewn that the table will be useful for roughly estimating irregular lands as well. It should be used in the following manner:—Supposing that a man walks up one side of a field and finds it is, say, 300 paces long, then when he comes to the corner and turns at right angles, if he has the table in his hand and reads from left to right, he will see that 16 paces along that side will roughly mark off one acre, or 80 paces 5 acres, or 161 paces 10 acres, or 806 paces 50 acres, or 1,613 paces 100 acres. The application of the table to other regularly shaped areas is obvious, but with irregular fields it is less plain, though not difficult.

Supposing one side of a land is 400 paces and the *opposite* side is 600 paces with the top and bottom lines fairly straight between corners, then it may be reckoned that the field averages 500 yards wide, and roughly 10 paces along the top or bottom will mark 1 acre, 48 paces 5 acres, 97 paces 10 acres, 484 paces 50 acres, or 968 paces 100 acres. Should a field be very irregular in shape, it can be divided by imaginary lines into several strips each approximating to a rectangle, each measured separately and the results added together to get the total acreage.

It is admitted that the method given is very rough and results will only be approximate, but an approximate estimate based on measurement is better than a pure guess.

The men who are trained surveyors as well as farmers may doubt the value of estimates like the above, but it should be pointed out that only very few farmers are capable of measuring their land by triangulation, and what is here aimed at is the nearest possible estimate of acreage planted by everyone, and to make it as easy as possible for a farmer to get some idea of the size of his arable fields.

Approximate Measurement of Rectangular Land by Paces.

Number of paces along one side.	Number of paces along other side, at right angles to first, for—				
	1 acre.	5 acres.	10 acres.	50 acres.	100 acres.
50	97	484	968	4,840	9,680
100	48½	242	484	2,420	4,840
200	24	121	242	1,210	2,420
300	16	80	161	806	1,613
400	12	60	121	605	1,210
500	10	48	97	484	968
600	8	40	81	403	806
700	7	35	69	345	691
800	6	30	60	302	605
900	5½	27	54	269	538
1,000	5	24	48	242	484

Another very convenient method of finding the size of a piece of land, if it is planted to a crop by means of a mechanical planter, is to take the distance of the rows apart and the distance between plants in the rows. From this is calculated the number of plants per acre sown. Then if the number of grains contained in a bag of seed is known, it is easy to find out how many acres of land one bag will plant. The following table, for maize only, is based on this principle, and may be of use to men who have difficulty in measuring their lands. So far as maize is concerned, it gets over the problem of finding the area of irregular fields. It may also be mentioned that a given plot of ground measured one year, if unaltered, need not be measured again, and so, as new land is frequently sown to maize, it will only need to be measured the first year when the mealie planter is used.

Number of Acres Planted by one Bag of Maize.

Planting distance.	Acres planted per bag of 200 lbs. of seed.	
	Hickory King.	Salisbury White.
40 inches x 15 inches	About 13 acres	About 15 acres
36 inches x 18 inches	About 14 acres	About 16½ acres
48 inches x 15 inches	About 15½ acres	About 18 acres

If for instance the planter is set for 40 inches between rows and 15 inches in rows, then one bag of Hickory King will plant about 13 acres, or one bag of Salisbury White will plant about 15 acres.

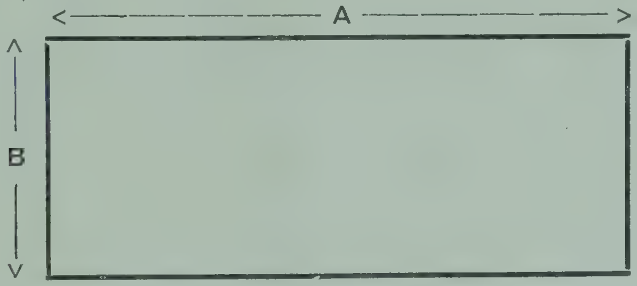
Should a farmer wish to use this table as a guide when purchasing seed, he must make an allowance in each case and reckon always that a bag will plant rather less than shewn in table, otherwise he will have no margin of safety to cover errors or accidents.

AREAS OF LAND OF VARYING SHAPES.

The writer is indebted to Mr. A. C. Jennings, Government Irrigation Engineer, for the methods of finding the areas of land of varying shapes.

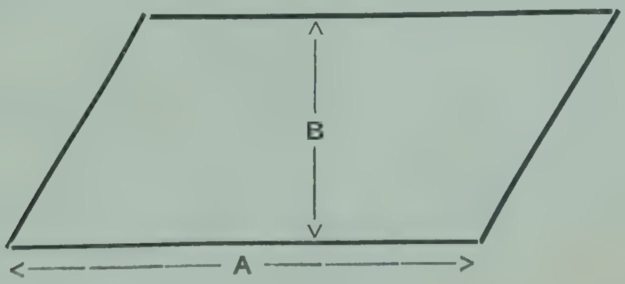
An error was unfortunately made in the fourth diagram, the line A C not being truly carried down to A.

Rectangle—



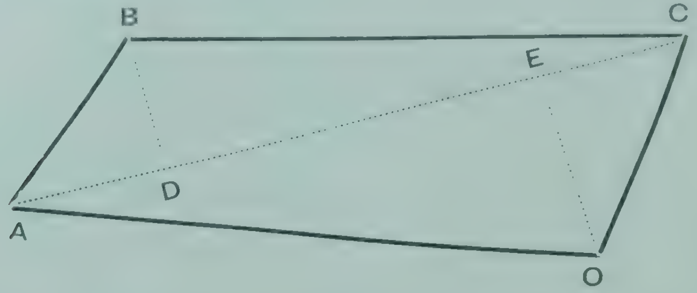
Distance A in yards multiplied by distance B in yards equals area in square yards.

Parallelogram—



Length of side A in yards multiplied by perpendicular distance B in yards equals area in square yards.

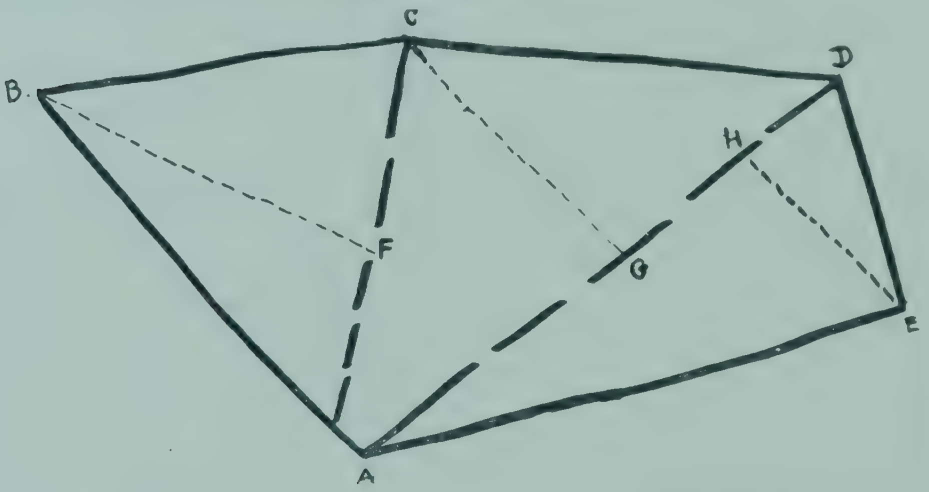
Four-sided Irregular Figure—



Measure in yards the lengths B D and O E, which must be perpendicular to A C; also measure A C.

Then the area in square yards equals:—Length B D added to length O E and multiplied by length A C and the product divided by two.

Irregular Figure of more than Four Sides—

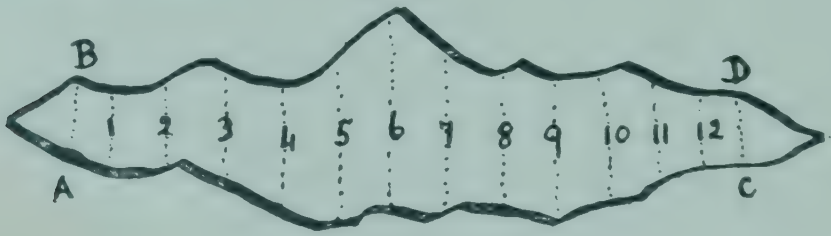


Divide the whole area into triangles and measure in yards the lengths A C, A D and the distances B F, C G and E H, which should be perpendicular respectively to A C and A D.

Multiply A C x B F,
,, A D x C G,
,, A D x E H,

add together the products and divide by two.

An Irregular Figure—



Between the ends A B and C D space off equal distances and measure in yards each of the parallel lines 1, 2, 3, 4, etc., across the breadth of the figure.

To find the area in square yards, add together the lengths of the intermediate parallel lines, and to the sum add half the sum of the two end breadths A B, D C.

Multiply the entire sum by one of the equal spaces between the parallel lines and the product will be the area.

Note.—1 acre = 4,840 square yards.
1 acre = 43,560 square feet.

Notes on Harvesting Cotton.

By H. W. Taylor, B.Agr., Tobacco and Cotton Expert.

In view of the fact that cotton is a new crop in Rhodesia, numerous enquiries are received for information regarding harvesting and disposing of the product.

Now that the rains are practically finished for the season, there is little danger of the lint being damaged by excessive moisture, and it is, therefore, not necessary to remove the seed cotton as soon as the bolls open. If picking is undertaken as soon as the bolls begin to open, the cost of harvesting is considerably increased, as the natives are required to cover a large area to obtain a small quantity of seed cotton. Picking should be delayed until at least one-third of the bolls are open (Fig. 1) and the labourers can then harvest a greater amount of cotton per day.

In picking only the seed cotton should be removed, and care should be taken to prevent dry leaves, portions of bolls, or other foreign substances from being mixed with the seed cotton, as dirty, trashy cotton is of lower value. Stained or dirty cotton should not be packed with the bright clean portion of the crop, but should be placed in separate packages, so that it may be ginned and sold separately. If the cotton is moist, from light showers or from dew when picked, it should be dried in the sun before packing in order to prevent mildew. For this purpose a bucksail or wire netting platform can be used.

When the seed cotton is dry it can be packed in wool packs or similar receptacles and stored in a dry place. Wool packs are very convenient for this purpose, and if unobtainable from merchants they can be made from strong hessian. They are about 24 inches square and 5 feet 6 inches in length. They can be suspended from the four corners, of the open end, and the seed cotton can then be trampled down by a small native. When properly filled, a wool pack will hold about 400 lbs. of seed cotton.

Natives are very slow in picking when they first begin work, but with patience they can easily be taught so that they will pick sufficient cotton to pay for their hire. They should be instructed to grasp all locks of the bolls at the same time and to remove the seed cotton with a quick jerk. Proper receptacles for picking greatly facilitate the work. Ordinary sugar pockets, or bags of the same size, are very convenient for this work. The mouth of the bag should be kept open by a wire hoop and a strong cord is fastened to either side of the mouth of the bag. The cord is then slung over the neck and one shoulder and both hands are left free for picking. When properly trained, natives should pick 50 lbs. of seed cotton per day, and for this amount 1s. is a cheap wage. Last season in some sections of the United States of America the cost of picking was as high as 8s. per 100 lbs. of seed cotton.

When harvesting is finished the seed cotton should be properly marked with the grower's name or number and despatched to the Farmers' Co-op., Ltd., Salisbury, where it will be ginned and prepared for market.

Forestry in Rhodesia.

TWO USEFUL SOFTWOODS.

By J. S. Henkel, Forest Officer.

In the article "Why grow Trees?" which appeared in the April number of the *Agricultural Journal* reference was made to two hardwoods, namely, *Eucalyptus tereticornis* and *Eucalyptus citriodora*. In the present article it is proposed to deal with two softwoods which are

Field of cotton ready for picking, Alderley Farm, Arcturus, property of Mr. H. D. Rawson.

Field of cotton, Marston Farm, Bindura, season 1919-1920, property of Mrs. H. M. Mackendrick.

growing satisfactorily at the Forest Nursery near Salisbury. These two trees possess properties which render them suitable for a variety of purposes, and past experience has shewn that the timbers they produce fill wants for which it is difficult to find substitutes. The two trees are: *Populus alba*, the white poplar, and *Cupressus torulosa*, the Himalayan cypress.

When exotic trees are introduced into a new environment it is not possible to say how they will develop, or even if the growth be satisfactory whether the timber produced will equal the reputation enjoyed by the trees in their habitat. In some cases it happens that a tree, considered of little value when judged by competitors growing with it or in localities not far removed, becomes of considerable importance in a treeless country or a locality where the indigenous timbers are of a character not adapted for many local needs. Similarly it may be that trees of vigorous growth, producing timber of high quality in their habitats, when cultivated in a different environment produce poor growth and inferior timber. As an example of the former case the *Pinus insignis*, a native of California, is a typical instance. This tree is being extensively cultivated in Southern Africa and Australia, where it not only grows faster but produces a timber suitable for general building purposes and for shooks for the fruit industry. As an instance of the latter case, *Eucalyptus marginata*, which produces the famous jarrah wood, may be cited. Though this tree has been planted in a variety of situations apparently approximating the conditions of its habitat, it has failed to make adequate growth and to produce suitable timber.

In the case of the poplar and cypress group of trees the results obtained with many of the species experimentally planted are such that they merit continued cultivation on an extended scale. In modern forestry as in other business propositions necessitating capital, the principle followed is to secure the best financial returns in the shortest space of time, and, as a rule, the trees which are to be cultivated should be those of fast growth and which at the same time produce timber to supply the existing, as well as the future, needs of the community.

While the State should possess adequate forest areas stocked with suitable timbers, the farmer has his place in the production of timber. He is interested in increasing his income as well as adding to the permanent value of his farm. In a recent Farmers' Bulletin (No. 1,171) issued by the United States Department of Agriculture, it was stated that "the forest lands held by farmers in the Southern States constitute a total area of about 124,000,000 acres, which is more than one-third (35 per cent.) of all the farm lands of that section. It may surprise some to know that farm woodlands represent more than one-half of the entire forest land in the Southern States, including the great holdings of the lumber companies, and yield annually $94,000,000, or £18,800,000 worth of timber products. The value of timber products in 1919 on account of enhanced values and probable increased cut is estimated at about $140,000,000, or £28,000,000."

Since timber in one or other form is so necessary for the well-being of a country, it is not surprising that the American Government should endeavour to assist forest owners by advice and guidance as to correct methods of managing and utilising their woodlands so as to secure the best results.

In Southern Rhodesia many farmers possess woodlands of various types containing trees and shrubs, many of which are at present considered of little value, but it is possible by proper methods of treatment to make them of some use. In other cases it may be desirable, to meet the need for special kinds of timber, to plant groves of exotic trees of more rapid growth than the indigenous species. Each locality must be considered on its merits, and a selection of trees made which give reasonable promise of adapting themselves to the environment and which at the same time produce timber of value.

White Poplar (*Populus alba*).—At the Forest Nursery in some low-lying, badly drained ground a small grove of *Populus alba* (white poplar) was planted. It is unfortunate that the exact date of planting cannot at present be ascertained, but this is of no great moment, for the important thing is that this tree has demonstrated its adaptability to conditions which obtain in many parts of the country. From a careful examination of the grove it is clear that the majority of the trees originated from a limited number of parent trees. Stumps indicate that from time to time the best stems have been removed. The largest trees in the grove at present are five inches in diameter and forty feet high. Surrounding the larger stems is a dense thicket containing saplings, which in time will develop into large trees with clean straight boles. These saplings originated from suckers developed under most adverse conditions, namely, amid a dense crop of grass in some places eight feet high. Had the soil been cultivated it is reasonable to suppose that not only would the trees have been taller, but the area occupied by the grove twice its present extent. The trees are healthy, and many shoots indicate an annual height growth of six to eight feet.

The white poplar is a large deciduous tree from the West Himalaya, occurring between 4 to 10,000 feet elevation, wild and cultivated. It also extends to Europe and North Africa and north to Siberia. The tree produces a timber which is light in weight and of a white colour, and it is in demand for matches, boxes, furniture, flooring, bed boards in wagons, general building purposes and pulp. The timber does not splinter, nor does it readily burn.

In Southern Africa only the male tree is grown. Apparently the female tree has never been introduced. In the summer months the leaves, with their snowy-white, cottony under-surface, present a pleasing appearance as they flutter in the wind, and contrast strikingly with the more sombre foliage of the dominant indigenous trees. The white poplar loves moist places; its growth is rapid, and under favourable conditions suckers from parent trees spread rapidly, so that in the course of a few years, with hardly any assistance from man, a grove of considerable extent is established. As the tree is deciduous, it is more or less indifferent to the long dry winter, for that is the time when it rests from its summer labour. Being a lover of moisture its position in farm forestry is easily located. The places to plant it are along stream and river banks and low-lying ground which is inundated during the summer months. While the tree will grow from cuttings, it is better to originate groves by using suckers. In localities liable to late frosts the young shoots up to six feet or more in height are liable to be cut back for a few seasons and cause some disappointment, but in most cases it has been found that eventually a few stems get above the frost line, and the protection they afford to their neighbours is such that in seasons following a good stand results. Sometimes the parent suckers are apt to develop into bushy, much branched trees, but in this case there should be no hurry to prune them, for the reason that the greater the leaf surface the more nourishment is supplied to the root-suckers originating from the mother tree. It is from these suckers that the best trees will eventually be obtained. The thicket originating from suckers should be thinned out when the saplings are about six to ten feet high—only the best stems should be given space to develop. No harm will be done by a little judicious pruning.

Once a grove has been established it is difficult to eradicate it, hence it is undesirable to plant the tree adjoining good agricultural land or near orchards. There are few trees that can stand more mismanagement than the white poplar, nor are there many that will respond more quickly to kind treatment. The tree is a real farmer's friend; no sooner is one stem cut when dozens take its place. In favourable localities the tree in a few years will supply an abundance of wattles for hut building, etc.; in ten years long straight spars so useful on a farm; and in twenty years the larger stems can be sent to match factories or to sawmills to be sawn in shooks or timber for other useful purposes.

Besides the white poplar there are other species of the genus which are likely to do well in Southern Rhodesia, and steps are being taken to introduce them from the Union, where they are doing well.

Himalayan Cypress (*Cupressus torulosa*).—The other softwood to which attention is directed is *Cupressus torulosa*, the Himalayan cypress. This tree is also a native of India, being found in the outer ranges of the Western Himalaya from Chamba to Nepal, between 5,500 and 9,000 feet elevation. In its habitat it attains to large dimensions. Trees with a girth of 22 feet and a height of 154 feet have been recorded. Its timber is very durable and suitable for building purposes, furniture and railway sleepers, etc.

The accompanying photograph represents a group of Himalayan cypress growing in the old hospital grounds in Salisbury. The trees were probably planted soon after the hospital was built. The tallest is 52 feet in height and 59 inches in girth at breast height. These trees, apart from their value as timber when grown in forest form, are beautiful as individual specimens, with their graceful branches feathering the stem to the ground.

At the Forest Nursery there are scattered groups of this cypress. Many of the trees have fine straight boles, but being scattered and mixed with other species, do not lend themselves for measurement of volume production. There is, however, a small plot of about half an acre in extent growing on rather a stiff clayey soil which appeared worthy of measurement. Even this stand is not pure, for there are a few specimens of *Cupressus lusitanica* mixed with it. A few dominant trees have been felled, but as the stumps are present it has been possible to estimate the diameters and include them in the volume calculations. An area of one-tenth of an acre was selected for measurement, not so much to shew the volume produced, but to indicate the hardiness of the tree under conditions far from favourable both as regards soil conditions and tending.

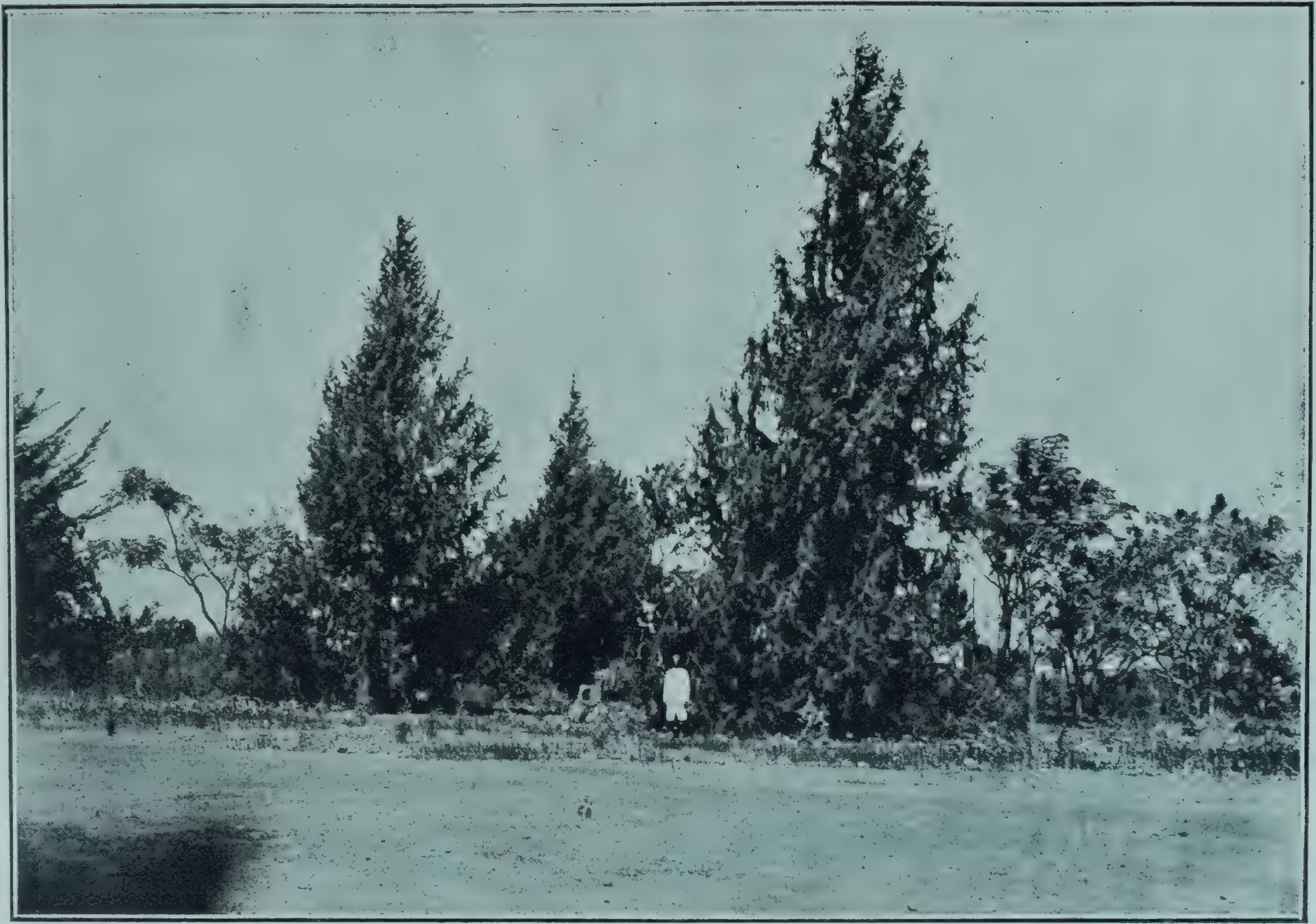
The sample plot measured on the 17th of May yielded the following data :—

Inch classes. (Diameter at 4½ feet.)	Number of trees in each class.	Sectional area. (Sectional area of class × number of stems.)
1	17	Discarded in volume calculation
2	35	
3	45	2·2096
4	27	2·3571
5	30	4·0920
6	15	2·9445
7	6	1·6038
8	5	1·7455
9	2	·8836
10	1	·5451
	131	16 3812

The mean sample tree was obtained by the usual formula $= \frac{16\cdot3812}{131} = \cdot1250$ which is equivalent to a tree 4.8 inches in diameter. A sample tree of the dimension indicated was felled and the volume ascertained. The sample tree was 28 feet 5 inches in height and the volume, exclusive of bark and branches and for a length of 24 feet where the bole was 1 inch in diameter, was 1.67 cubic feet. Multiplying the volume of the sample tree by the number of trees in the plot, *i.e.*, 1.61 x 131 = 218.77 or 2,187 cubic feet per acre containing 1,311 stems.

The age of the plot is estimated to be 13 years, consequently the mean annual increment is 168 cubic feet. An inspection of the table of inch classes will shew that there were 52 trees under 2½ inches in diameter, which were not taken into consideration when calculating the volume. The plot has been kept too crowded, and should have been thinned when about five years old. The suppressed stems, none of which is dead, indicate that the species can bear a considerable amount of shade.

It is interesting to note that the mean annual increment of 168



Cupressus torulosa, the Himalayan cypress, old hospital grounds, Salisbury. Photo taken May, 1920.

cubic feet is greater than that for *Eucalyptus tereticornis* and *Eucalyptus citriodora*, which were 137 and 126 cubic feet respectively.

So far as observed, not only at the Forest Nursery, but in various places within and in the neighbourhood of Salisbury, the tree is growing vigorously. It appears to be distasteful to termites and capable of withstanding the severe strain of a long dry winter and at the same time is not exacting in regard to soil conditions. These qualifications are sufficient to entitle it to a place in farm forestry.

The Cultivation of Rice in Southern Rhodesia.

By H. G. Mundy, F.L.S., Agriculturist and Botanist.

The fact that in the past rice has been grown to a very considerable extent by the natives of Rhodesia is evidenced by the large numbers of abandoned rice pits which are to be seen in nearly all parts of the country. During dry years prior to the war production apparently fell off by reason of the poor crops obtained, but with the advent of a wetter cycle more native rice has of late been grown, and many enquiries have been received from farmers possessing tracts of wet soil on their farms, regarding the possibilities of growing rice as a European crop. This interest has further been stimulated by the very high prices which have recently obtained for rice. In order to secure the fullest information possible, the assistance of the Native Department was invited, and through the courtesy of the Chief Native Commissioner and his staff, very complete reports on native production have been received from all parts of the Territory. In the present article, the information conveyed in these reports has been summarised and deductions have been drawn as to the possibilities of rice becoming better recognised as a European crop.

In the course of crop introduction work during the years 1909-13 a series of experiments with dryland or hill rice, as a rainy season crop, was conducted on the Salisbury Experiment Station. As is generally known there is neither "wet land" nor irrigation on this station, and results were in consequence not very encouraging. The soil being insufficiently retentive of moisture, the crops failed to stool as they should do and yields were small. A considerable amount of seed was also issued in the course of co-operative experiments, and when planted in vlei soils good returns were in many cases recorded. As far as is known, however, only one farmer, Mr. A. R. Jelliman of Macheke, grew the crop on any large scale, and it is understood that he did not go further with it owing to uneven ripening and the consequent labour of harvesting, and also to the lack of adequate machinery for husking.

The experience of both European farmers and natives, clearly proves that as far as suitability of soil is concerned there are very considerable tracts of country well adapted to rice growing, and which until draining can be undertaken are in many instances better suited to rice than to any other crop.

Speaking generally we find that native rice is grown in practically all districts of Southern Rhodesia favoured with a rainfall of twenty-five inches or more and possessing tracts of ill-drained swampy land, which remain moist for the greater part of the year. The districts in which it is not grown are Bulawayo, Umzingwane, Bubi, Matobo, Gwanda, Nyamandhlovu, Wankie, Insiza and but little in Ndanga. With these exceptions it is a more or less accepted native crop throughout the Territory, but curiously enough is regarded as a woman's crop, and the men folk seldom, if ever, take any hand in its production. In most districts it is regarded in the nature of a luxury owing to the labour involved in the primitive methods of harvesting and husking employed, and also because it cannot be converted into kaffir beer. On the other hand, it is becoming increasingly popular in certain areas, and wherever it can be grown a reserve of seed is always maintained by the natives for use in a favourable season.

Considerable difficulty has been experienced in arriving at any decision as to the number or type of the native varieties. Some which, from the description supplied, appear to be the same, are in certain instances reported under different names, while different authorities refer to a given variety under the same name, but some describe it as a red rice and others as a white grained type. Under a general generic name of Mapunga or M'pungo, applied to the crop as a whole, the following varieties appear to be fairly widely recognised, though the accuracy of their descriptions cannot be vouched for:—

Mrewa District—

Chitiriko: Straw 18 inches, ears erect, grain white, late variety, quality fair.

Munyayi: Straw 1½ feet, grain red, very early maturing, quality fair.

Mrewa, Charter and Makoni Districts—

Dembaremba: Straw 2 feet, ears drooping, grain red, early maturing, quality good.

Mrewa and Mazoe Districts—

Diti: Straw 3 feet, ears erect, grain white, late variety, quality fair.

Salisbury, Darwin, Mazoe and Makoni Districts—

M'tirigu: Straw 3 feet, small ears, grain white, does not shed readily, quality good; said not to yield so well as Dembaremba.

Mazoe, Victoria, Chibi, Gutu, Chilimanzi and Selukwe Districts—

Mungeri or M'gori or M'chechene: Straw 2 feet, small erect ears, grain white, sheds readily; said to be the best yielder.

Soils and Methods of Preparation.—Without exception the natives select low-lying, swampy soil for the crop. When sufficiently retentive of moisture the strong black soil (*Chinyakwe*) is preferred, but much rice is grown on the grey sandy loams (*Shapa*) or on the black granite vleis (*Matoro*). Adequate moisture is the governing factor, not fertility. The crop is frequently sown on virgin soil which has been broken up some six months previously. Sometimes, however, a native root crop, *Tsenza, Plectranthus sp.*, is grown the previous year or again on very damp land; early maize and pumpkins may be sown thinly in August, and the rice may be put in between these about October. Wet land not as a rule being very adjacent to bush, the cultivators are usually too indolent to carry bush and burn it on the land. This may occasionally be done, but usually the soil is unaided by any form of manuring. Until late years all native rice was grown in pits (*Matimba*), the ground being first hoed over and then brought together to form circular basins four to six feet in diameter, with the sides raised a foot or so above the surrounding ground level. In these basins, which caught and retained the moisture, the rice was sown. With the more common use of the plough, however, the pit system is gradually being abandoned, and the land is now often ploughed in ridge and furrow, the furrows holding the moisture, and the rice being sown on the lower slopes of the ridges. In other cases where there is so much moisture in the soil that no methods of conservation are called for, the land is merely ploughed deep in early spring, and the crop is then grown in the same way as wheat, oats or barley.

Sowing.—Date of sowing appears to vary within as wide a range as August to November, dependent upon the moisture retaining capacity of the soil. October would, however, appear the favourite month. Eighteen to twenty pounds of seed is used per acre, and is either sown thinly by hand *in situ* or thickly in seed beds, the young plants subsequently being transplanted into the larger "lands." In the kafir gardens and with indifferent preparation of the land, weeds are a constant danger, and the crop is usually hand weeded once or twice until the rice is sufficiently strong to hold its own. The crop requires from five to six months or even more to mature, and is harvested from March onwards.

Most varieties, especially if thinly sown and stooling much, have a tendency to ripen unevenly, and the difficulty of harvesting is enhanced when this feature is combined with a tendency to shed the grain. In such cases the grain is stripped from the ears by hand as it ripens, while with strains less liable to shedding, the heads as they mature are cut off with a knife.

Reports regarding the yield per acre vary greatly, as is to be expected. The average appears to be about five to six bags per acre, but the Native Commissioners of Marandellas and Victoria estimate it as high as fifteen to twenty bags. Normally, rice is grown for two to four years on the same land without manuring, after which new pits or lands are made.

Threshing, Husking and Storing.—After harvesting, the ears are laid in small heaps on the rocks to dry, and the grain is subsequently either rubbed out between the hands or beaten out with thin sticks. Husking is effected in the usual manner by stamping the grain in a native mortar (*duri*). Unhusked rice is seldom if ever attacked by weevil, although the reverse is the case with husked grain. When stored in the native grain bins (*Chitura* or *Izipole*) wood ashes are sometimes mixed with the grain as a preventive against weevil.

Insect Pests and Fungoid Diseases.—On the whole, native rice appears fairly free from either of these. Birds cause some loss, and cutworm and surface beetle are occasionally referred to as attacking the young plants. A form of stalk borer is also said to cause loss. A fungoid disease in the nature of a rust (*bisi*) is recorded as attacking the plants in very wet years, but evidence of this seems uncertain. In one case, however, it is definitely stated that when the crop is so attacked *bisi* plants are hung up along the path leading to the gardens to denote the presence of the disease.

From a consideration of the above facts it would appear that there are considerable areas of wet land, especially in the granite formation, which at present are only utilised for early grazing, but which should certainly grow rice under European methods of farming, provided the difficulty of uneven ripening could be overcome. That this difficulty is not insurmountable will be shewn in a subsequent article which will deal with rice cultivation in other parts of the world.

Notes on the Regulations governing the Sale of Fertilisers and Farm Foods.

By E. V. Flack, Assistant Agricultural Chemist.

The regulations which were promulgated in 1914 under the Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance to govern the sale of fertilisers and farm foods have recently been revised and new regulations, based upon the experience gained in administering the Ordinance, came into operation on 19th March, 1920. The attention of merchants and others connected with the fertiliser trade, as well as farmers, is drawn to the new regulations, which were published in the *Government Gazette* of the 19th March, 1920, and it is hoped that these explanatory notes will serve as a guide to all concerned, more especially to merchants, regarding the correct manner of making applications for the registration of fertilisers and farm foods, and to farmers as regards the purchase of such articles.

Object of the Ordinance.—The object of the Ordinance is to safeguard both the merchants and the purchaser by enforcing the former to give a guarantee as to the composition of the article sold or offered for sale, thereby enabling the purchaser to gauge the quality of the article and protecting the merchant from unscrupulous competition. The regulations provide—

(1) that all fertilisers and farm foods sold or offered for sale, except those specially exempted under the Ordinance, must be registered with the Director of Agriculture by the local manufacturer, importer or vendor, stating the name, brand and chemical composition thereof;

(2) that every purchaser of a registered fertiliser or farm food, except in the case of quantities under one hundred pounds in weight, must be furnished by the vendor with an invoice stating the guaranteed composition of the article purchased;

(3) that the guaranteed composition of a registered fertiliser or farm food must be expressed in terms which are prescribed;

(4) for the taking of samples for analysis;

(5) for the publication of the name, brand and guaranteed composition of each fertiliser or farm food registered under the Ordinance, including reports of analyses, in the *Government Gazette* and the *Agricultural Journal*;

(6) for the prosecution of any person contravening the regulations.

Summary of the Regulations. The regulations may be briefly summarised as follows:—

Registration.—Regs. Nos. 1, 2, 3.

Brands and Marking of Receptacles.—Regs. Nos. 4. 5, 8, 12 (d). 15 (d).

Sales.—Regs. Nos. 6 to 10, 12 (a) and (b), 14, 15 (a), 16, 17 and 18.

Grading of certain Fertilisers (viz., superphosphate, basic slag, sulphate of potash, muriate of potash, and treated phosphate rock).—Regs. Nos. 8, 9, 12 (b), (c) and 15 (c).

Degree of Fineness of certain Fertilisers (viz., basic slag, raw and treated phosphate rock, bone meal, bone dust and bone flour).—Regs. Nos. 10, 15 (e), 16.

Special Regulations re *Guano, Guano Phosphate, Bat Guano and Phosphate Rock.*—Regs. Nos. 13, 14, 15.

Taking of Samples and their Analysis.—Regs. Nos. 19 to 26 and 37.

Sterilisation of Bones.—Reg. No. 27.

General Regulations.—Nos. 28 to 36, 38 and 39.

ADMINISTRATION OF REGULATIONS.

Registration.—As previously stated every fertiliser or farm food, except those specially exempted under the Ordinance, must be registered before sale is allowed. The registration must be effected by the manufacturer or owner in the case of a locally produced article, and by the importer in the case of an imported article. When a fertiliser or farm food is consigned direct to the purchaser from without Southern Rhodesia, the manufacturer or exporter must appoint an agent within this Territory who for the purpose of the regulations will be regarded as the importer and will be held responsible for effecting the registration of the article. The form in which applications for registration are to be made is clearly stated in regulation No. 2, and applications for renewal of certificates of registration must be made annually on or before the 31st March of the year in which they expire.

Registration of Fertilisers.—In order to avoid mistakes when submitting applications for the registration of fertilisers, the attention of manufacturers and importers is drawn to the following points:—

(a) the percentage amount of "citrate" soluble phosphoric oxide, as determined by Wagner's method, must be given for all fertilisers of a phosphatic nature, with the exception of basic slag, basic superphosphate and phosphate rock;

(b) the percentage amount of phosphoric oxide soluble in 2 per cent. citric acid solution must be given for basic slag, basic superphosphate and phosphate rock;

(c) the determination of phosphoric oxide soluble in "citrate" or 2 per cent. citric acid solution will be conducted on the material as sent into commerce; details are given in regulation No. 11 concerning the method of determining the phosphoric oxide soluble in citrate and 2 per cent. citric acid solution;

(d) the percentage amounts of "iron oxide and alumina" and lime must be given in addition to the other particulars required in the case of treated or untreated phosphate rock;

(e) no application will be considered when a range of figures is given for any constituent;

(f) the percentage amount of any constituent must not be given beyond the first decimal place when stating the composition of a fertiliser;

(g) a certificate of sterilisation is required in the case of all fertilisers wholly or partly derived from bone;

(h) applications must be submitted in duplicate.

Registration of Farm Foods.—When submitting applications for the registration of farm foods the attention of those concerned is drawn to the following points:—

(a) no application will be considered when a range of figures is given for any constituent;

(b) the percentage amount of any constituent must not be given beyond the first decimal place when stating the composition of a farm food;

(c) only the percentage amounts of phosphoric oxide and lime are required to be stated in the case of bone meal, bone dust or bone flour;

(d) a certificate of sterilisation is required in the case of all farm foods wholly or partly derived from bone;

(e) applications must be submitted in duplicate.

Brand.—Every receptacle must be marked with the registered brand and name of the fertiliser or farm food in addition to any other requirements of the regulations. The "brand" may consist of any word or words, combination of letters, symbol or graphic or pictorial representation, and shall be of such a distinctive nature as will ensure identification of the article and its connection with the article as registered by the importer or local manufacturer. No brand likely to be mistaken for another already registered will be accepted for registration.

Sales.—At the time of delivery of a registered fertiliser or farm food to a purchaser the vendor must give or send an invoice to the purchaser stating the quantity sold and the registered brand, and chemical composition thereof. The forms of such invoices are prescribed in regulations Nos. 6 and 18 in order that there shall be no misunderstanding as to the particulars required from the vendor.

In the past some vendors have been in the habit of expressing in an advertisement or invoice each of the chemical constituents of a fertiliser in more than one form; in this connection attention is drawn to regulation No. 7, which provides that each constituent of a fertiliser shall be expressed as prescribed by the regulations *with no equivalents.* In order to illustrate this point clearly, the following trade advertisement may be cited, for the information of purchasers, as an excellent example of a fertiliser, the constituents of which were expressed with several equivalents:—

	Per cent.
(1) Total phosphoric oxide, P_2O_5	10·8
(2) Phosphoric oxide, citric soluble (2 per cent.)	9·0
(3) Equal to tribasic phosphate of lime, $Ca_3P_2O_8$	23·6
(4) Containing phosphate, citric soluble (2 per cent.)	19·6
(5) Containing phosphate, insoluble	3·9
(6) Nitrogen (N)	3·4
(7) Equal to ammonia (N H_3)	4·1
(8) Potash (K_2O), water soluble	2·0
(9) Equal to sulphate of potash	3·7

The above is a clear case of what is described as "packing the guarantee." Nos. 1, 2, 6 and 8 are the only items required. The remaining figures afford no additional information regarding the composition of the fertiliser, consequently they are only calculated to mislead the purchaser. The regulations prevent this so-called "packing of the guarantee."

Grading of Fertilisers.—In order to encourage the importation of high grade articles on account of the high ocean and railway charges, the regulations provide for the grading of the following fertilisers:—

Superphosphate.
Basic slag.
Treated rock phosphate.
Sulphate of potash.
Muriate of potash.

These fertilisers are graded as follows:—

Superphosphate.

Grade.

Under strength—containing less than 12 per cent. water-soluble phosphoric oxide.

Low grade—containing from 12 to 13 per cent. water-soluble phosphoric oxide.

Medium grade—containing from 13.1 to 15 per cent. water-soluble phosphoric oxide.

Medium high grade—containing from 15.1 to 17 per cent. water-soluble phosphoric oxide.

High grade—containing over 17 per cent. water-soluble phosphoric oxide.

Basic Slag.

Grade.

Low grade—containing from 12 to 14 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

Medium grade—containing from 14.1 to 16 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

High grade—containing over 16 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

Treated Phosphate Rock.

Grade.

Under strength—containing from 6 to 10 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

Low grade—containing from 10.1 to 14 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

Medium grade—containing from 14.1 to 16 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

High grade—containing over 16 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution.

Sulphate of Potash.

Grade.

Low grade—containing from 48 to 50.9 per cent. potash (K_2O)

High grade—containing not less than 51 per cent. potash

Muriate of Potash.

Grade.

Low grade—containing from 55 to 59.9 per cent. potash (K_2O)

High grade—containing not less than 60 per cent. potash

All receptacles in which the above fertilisers are put up for sale unmixed with other fertilisers must be marked with the grade as well as the name and brand of the fertiliser, and in the case of superphosphate, basic slag and treated phosphate rock, each receptacle must, in addition, be marked with the actual minimum percentage of phosphoric oxide soluble in water or 2 per cent. citric acid solution, as the case may be, contained in the fertiliser.

Degree of Fineness of certain Fertilisers.—The fertilisers, basic slag, raw or treated phosphate rock, bone meal, bone dust and bone flour must conform to certain degrees of fineness before being offered for sale [*vide* Regulations Nos. 10, 15 (e) and 16]. Basic slag, raw and treated phosphate rock must be guaranteed to be of sufficient fineness to permit of at least 80 per cent., 85 per cent. and 80 per cent. respectively, passing through a standard wire sieve, the meshes of which are from .14 to .17 millimetre square and which measure diagonally from .22 to .24 millimetre. Bones may be sold as "bone meal," "bone dust," or "bone flour" according to the degree of fineness. In the case of bones sold under the name of "bone meal" or "bone dust," at least 80 per cent. must be capable of passing through a sieve having round holes of 3 millimetres diameter; further, in the case of "bone dust," at least 50 per cent. must pass through a sieve having round holes of 1 millimetre diameter. "Bone flour" must be fine enough to permit of at least 80 per cent. passing through a sieve having round holes of 1 millimetre diameter.

Guano, Guano Phosphate, Bat Guano and Phosphate Rock: Special Regulations. Any fertiliser sold under the name "*guano*" is taken to mean solely the collected excreta of sea birds. The excreta of bats, steamed, boiled or powdered fish or fish refuse, and whale scrap may be sold under the names "bat guano," "fish guano" or "whale guano," as the case may be, but must not be sold as "guano." Guano from which all or practically all the nitrogen has disappeared shall not be sold as "guano," but may be sold as "phosphatic guano" or "guano phosphate." In any case where the word "guano" is not preceded by the qualifying term "bat," "fish" or "whale," it shall be taken to mean solely the collected excreta of sea birds (Regulation No. 13).

Bat Guano, as defined in Regulation No. 14, must contain at least 2½ per cent. of nitrogen, and at least 8 per cent. of nitrogen and phosphoric oxide taken together. The average composition of thirty-eight samples of bat guano analysed at the Agricultural Laboratory, Department of Agriculture, Salisbury, was as follows:—Total nitrogen, 3.9 per cent., total phosphoric oxide 9.7 per cent. and total potash 1.1 per cent. It will thus be seen that the prescribed standard for bat guano is not too stringent, and is one to which no objection ought to be raised.

Phosphate Rock.—Any fertiliser sold under the name of raw phosphate rock must contain at least 10 per cent. of phosphoric oxide [Regulation No. 15 (a)], whereas any treated phosphate rock, other than such as may contain more than 5 per cent. of phosphoric oxide soluble in water, made by the application of any chemical process or processes to raw phosphate rock must contain at least 6 per cent. of phosphoric oxide soluble in 2 per cent. citric acid solution [Regulation No. 15 (b) and (c)].

Sterilisation of Bones.—Fertilisers or farm foods containing bone or any material derived from bone, such as bone meal, bone flour, bone dust, dissolved bones, bone compound or the like, cannot be imported or sold unless such bones have been sterilised by subjection either to—

(a) a dry heat of 140 deg. centigrade for not less than three hours; or

(b) a moist heat (under pressure) of 105 deg. centigrade for not less than fifteen minutes.

A declaration to this effect must be furnished by the importer or vendor at the time applications are made for the registration of such articles.

Taking of Samples and their Analysis.—The sampling and analysis of fertilisers and farm foods are provided for in Regulations Nos. 19 to 26 and 37. The method of taking samples on behalf of the Government and by purchasers is so explicit in the regulations that there is no need to enlarge on the subject in these notes.

FERTILISERS—GENERAL REMARKS.

Under the regulations governing the sale of fertilisers, we are mainly concerned with the plant foods nitrogen, phosphoric oxide and potash, which are the three constituents required for the nutrition of plants in which soils are liable to be deficient.

Nitrogen, which is the most expensive ingredient in fertilisers, may exist in three forms, viz.: (1) in the form of "nitrate," *e.g.*, nitrate of soda; (2) in the form of an ammonium salt, *e.g.*, sulphate of ammonia; (3) in the form of an organic compound, *e.g.*, urea. In this connection attention is drawn to Regulation No. 3 (b) regarding the manner in which the form of nitrogen is to be expressed in applications for registration.

Of the three forms of nitrogen mentioned above, that supplied in fertilisers in the form of "nitrate" is immediately available as plant food without undergoing any change in the soil.

Nitrogen supplied to the soil in the form of an ammonium salt undergoes conversion to the "nitrate" form before it is assimilated by plants; this change, however, takes place so rapidly that the nitrogen in ammonium salts can be made use of by plants almost as quickly as that supplied in the form of "nitrate."

In the case of organic nitrogenous fertilisers, there is great variation in the rapidity with which the organic nitrogen becomes available to plants. When such fertilisers are applied to the soil, the organic nitrogen has to be converted, through the agency of soil organisms, first to ammonia and finally to "nitrate" before it becomes available as plant food. The rate at which these changes take place is dependent upon the forms in which the organic nitrogen is supplied to the soil. The organic nitrogen in blood meal, for example, undergoes these changes much more quickly, and becomes more rapidly available as plant food than that supplied in ground horn or wool waste. A unit of organic nitrogen supplied in the form of blood meal is therefore more valuable than one supplied by ground horn or wool waste, consequently it is laid down in the regulations that the source, or sources, of nitrogen in compound fertilisers must be stated in applications for registration and on invoices supplied to purchasers.

Phosphoric Oxide.—In the regulations, forms of phosphoric oxide of the following degrees of solubility are recognised in fertilisers:—

(a) Phosphoric oxide soluble in water, (b)* phosphoric oxide soluble in "citrate" solution, (c)* phosphoric oxide soluble in 2 per cent. citric acid solution, (d) phosphoric oxide insoluble in the above-mentioned solvents.

In section 11 (a) and (b), particulars are given of the methods by which the "citrate" and citric acid soluble phosphoric oxide in fertilisers are to be determined. The method of determining the latter as stated in the section is self-explanatory. For the determination of "citrate" soluble phosphoric oxide, stock "citrate" solution is prepared as follows:—150 grams of citric acid are dissolved in water and neutralised with ammonia, using rosolic acid as indicator, to the neutral solution, 10 grammes of citric acid are added and the solution diluted to one litre. Dilute "citrate" solution used for the determination is prepared, as required, by diluting the above stock solution with four times its volume of water. To determine the "citrate" soluble phosphoric oxide in a fertiliser, 5 grammes of the material as sent into commerce, *i.e.*, without grinding or sifting, are shaken up for half an hour with 500 c.c. of dilute "citrate" solution in the manner prescribed in section No. 11 of the regulations. The solution is then filtered and an aliquot part of the filtrate taken for the determination of "citrate" soluble phosphoric oxide.

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*The amount of phosphoric oxide soluble in 2 per cent. citric acid solution has only to be guaranteed in the case of basic slag, basic superphosphate and phosphate rock. In all other fertilisers containing phosphate, the guaranteed amount of phosphoric oxide soluble in "citrate" solution must be stated.

The quickest acting phosphatic fertilisers are, naturally, those which contain the largest amount of phosphoric oxide soluble in water; such fertilisers are superphosphate, dissolved bones and dissolved guano. The forms of phosphoric oxide insoluble in water but soluble in "citrate" and citric acid are the next in order of value, because they become more quickly assimilable by plants than the forms insoluble in these solvents. The buyer is thus able to gauge from the guaranteed compositions of phosphatic fertilisers the relative availability of the phosphoric oxide contained therein.

Potash.—The more common salts of potassium occurring in fertilisers are the sulphate, chloride (muriate) and nitrate. Carbonate of potash is also sometimes applied to the soil in such forms as wood ash or kraal manure ash, etc., where supplies of these materials are available.

Some forms of potash are not regarded with favour for certain crops, *e.g.*, muriate of potash is said, by many authorities, to have an injurious effect upon the burning qualities of tobacco; consequently it is laid down in the regulations that the form or forms in which the potash is present in compound fertilisers must be stated in applications for registration, and on invoices supplied to purchasers.

Lime.—Under the regulations, the only fertilisers in which the lime content has to be stated are raw and treated phosphate rock. This provision is made in order to determine how the phosphoric oxide is combined in the material. In phosphate rock, the phosphoric oxide may be present as phosphate of iron, phosphate of alumina or phosphate of lime, and of the three forms, phosphate of lime is the most valuable for fertilising land.

FARM FOODS—GENERAL REMARKS.

The regulations governing the sale of farm foods have already been dealt with. The fact that the composition of all artificially prepared feeding stuffs, subject to registration, must be guaranteed in terms of the regulations enables buyers to gauge their relative feeding values and protects merchants from unscrupulous competition.

Copies of the regulations governing the sale of fertilisers and farm foods under the Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance can be obtained on application to the Director of Agriculture, Salisbury.

Hints on Dips and Dip-Testing.

By A. W. Facer, B.A., Assistant Agricultural Chemist.

It would evidently save much trouble and delay if the farmer could test his dip, or have it tested, on the spot, instead of packing a sample and forwarding it, often from a considerable distance, to the Agricultural Chemist, Salisbury.

To render this possible field-testers of different kinds have been placed on the market from time to time. The Standard Arsenic Company, Salisbury, have produced the "Champion Dip-testing Apparatus," which when properly manipulated gives results with the average dipping fluid which are sufficiently accurate for practical purposes, and in any cases where confirmation of the field test is desired, samples can always be sent to the Agricultural Laboratory, Salisbury. The booklet of instructions accompanying the outfit contains some extremely useful tables, enabling one to evaluate and correct the strength of a dip in terms of any of the dips on the Rhodesian market.

The dip sample to be tested should always be taken in a clean dry bottle of about one pint capacity, after the tank fluid has been thoroughly stirred (preferably by cattle passing through), and should be tested as soon as possible after it is taken.

The tables referred to in these notes are those contained in the Champion booklet, and the apparatus and chemicals referred to are those supplied with the Champion dip-testing apparatus.

Dipping is a convenient means of poisoning ticks with arsenic, either by direct action of the tank liquid upon the ticks, or by their subsequently taking in arsenic which has been absorbed through the animals' skins. Tank liquids must be maintained at such strengths that they are effective and yet safe, *i.e.*, they must contain sufficient arsenic to poison ticks, but not so much that the cattle are scalded by passing through. Careful research has proved that the effective and safe solutions for dipping at different intervals are:—

.08 per cent. arsenious oxide for 3 day dipping.
.16 per cent. arsenious oxide for 7 day dipping.
.24 per cent. arsenious oxide for 14 day dipping.

Solutions which are much weaker than the above for the prescribed intervals are useless, because they do not kill the ticks; solutions which are much stronger for the prescribed intervals are dangerous, as scalding may occur, perhaps with fatal results.

From the dip-mixer's and dip-tester's point of view all the cattle dips on the market, whether liquid preparations such as Champion dip and liquid arsenite, Cooper's, or Arsenoda, or solid arsenite of soda, are essentially the same; they contain large amounts of arsenious oxide, rendered soluble by combination with soda. Substances such as tar-products and aloes which are added to some dips to impart odour, taste, adhesiveness or greater wetting power to the diluted fluid do not concern the tester. His aim is to find the strength of the fluid in terms of arsenious oxide per cent., and anyone hoping to get a grip of the science of dip-testing must learn to think habitually in terms of arsenious oxide per cent. Since all cattle dips on the Rhodesian market consist essentially of the same substance—arsenious oxide in combination with soda—it follows that they can be mixed together in the same tank. When a dipping fluid is made up from more than one dip, due regard must of course be paid to the relative strengths of the dips, which are expressed in a convenient form in the section headed "Useful Formulæ" (page 5 of the Champion Instruction Booklet).

Method of Testing.—A tank fluid contains water, muck, soda, arsenious oxide and various other substances which are added to render the fluid bitter to the taste, etc. Arsenious oxide possesses the property of absorbing iodine in a certain definite proportion (2 ounces of arsenious oxide absorb about 5 ounces of iodine). The arsenious oxide in dips can therefore be found by testing a measured quantity of it with "testing solution" of iodine which has been very carefully made up at a certain definite strength. As the soda in dips would interfere, it is removed by adding sulphuric acid (acid solution "A" in Champion outfit), from 20 to 30 drops per bottle of dip usually being sufficient. When sufficient acid has been added the muck usually settles as a curd-like sediment, enabling one to pour off a clear liquid from the top, after the bottle has been allowed to stand for a short time.

The clear fluid is now poured off into the measuring cylinder. If it does not clarify after the addition of acid in reasonable quantity (up to about 40 drops for a whisky bottle) it should be filtered. Exactly 50 cubic centimetres are then measured by the cylinder and put in the small beaker provided. The fluid now contains some acid which would interfere with the test, and must therefore be counteracted by adding bi-carbonate of soda (alkali D of testing outfit) until there is no further effervescence. A little gloy is then added. Gloy contains dissolved starch, which gives a blue colour with the slightest trace of "free iodine." The dipping fluid is now ready for testing. The burette tube is then filled up to the "O" mark with the iodine testing solution, care being taken that the portion below the tap is also filled; and by turning the tap, testing solution is gradually introduced into the beaker containing the dip, the latter being thoroughly and constantly shaken during the process. Unless the dip is abnormally weak no blue colour is produced by the iodine solution at first.

As the addition of iodine proceeds the blue colour appears, but rapidly disappears on shaking; after a time, however, the blue colour tends to persist and disappears less quickly on shaking. This indicates that the "end point" is approaching. After the addition of a little more iodine the dip often gets somewhat darker in colour, a brownish-purple tint being observable. From this point on iodine should be run in three or four spots at a time, with constant shaking, until a decided blue colour appears and persists when thoroughly shaken. When this occurs the operation is completed, and the number of cubic centimetres of iodine solution absorbed by the dip is observed by reading the burette. By dividing this number by 100 we get the amount per cent. of arsenious oxide in the dip. (This is only true when exactly 50 cubic centimetres of dip are taken for the test.) For example :—

12.5 c.c. iodine solution correspond to .125 per cent. arsenious oxide.
10 c.c. iodine solution correspond to .1 per cent. arsenious oxide.
5.5 c.c. iodine solution correspond to .055 per cent. arsenious oxide.

The strength of the dip in terms of any of the recognised dip materials can now be found by reference to the tables in the Champion booklet. These tables give the dip values for whole numbers and half cubic centimetres of iodine solution only ; when an intermediate decimal is obtained it is sufficient for practical purposes to take the nearest figures given in the tables. Thus :—

for 11.6 and 11.7 c.c. used, take 11½ in the tables ; and
for 11.8 and 11.9 c.c. used, take 12 in the tables.

Tank Control.—The regulation strengths for dipping at different intervals are :—

	3 day.	7 day.	14 day.
Arsenious oxide	·08 per cent.	·16 per cent.	·24 per cent.
	Galls. water.	Galls. water.	Galls. water.
Cooper's dip—1 gall. in	312	156	104
Arsenoda dip—1 gall. in	700	350	233
St. O'Gorman dip—1 gall. in ...	600	300	200
Champion dip—1 gall. in	600	300	200
Champion liquid arsenite of soda dip—1 gall. in	800	400	266
Solid arsenite of soda dip (80 per cent.)—1 lb. in	100	50	33

If a dip is much stronger or weaker than the prescribed strength for that dip at the given dipping interval, its strength must be corrected. If it is too weak the amount of any particular dip to be added is found by reference to the tables in the Champion booklet. If the dip is too strong the amount of water to be added can be calculated from the table given on page 5 of the Champion booklet, under the heading "Dip too Strong." That paragraph is as follows :—

> "For every .01 per cent. arsenious oxide that your dip is too strong, add to each 1,000 gallons in your tank the following quantities of water :—

For 3 day strength, 125 gallons;
For 7 day strength, 62½ gallons;
For 14 day strength, 41½ gallons."

A few examples will make the application of this table more clear :—

(a) A sample of Champion dip gave .116 per cent. arsenious oxide when tested. What correction must be made for 3 day dipping? Reference to the Champion tables shews that .116 per cent. arsenious oxide corresponds to 1 Champion in 417. As the standard 3 day strength for Champion is 1 in 600, the dip is too strong and must therefore be diluted. It contains—

.166 per cent. arsenious oxide,

and .08 per cent. arsenious oxide is the standard strength for 3 day dipping, *i.e.*, it contains .036 per cent. arsenious oxide more than the required amount.

The table states that for 3 day dipping 125 gallons must be added per 1,000 gallons for each .01 per cent. that the dip is above standard strength.

$$\text{Therefore } \frac{.036}{.01} \times 125 = 3.6 \times 125 = 450 \text{ gallons of water}$$

must be added for each 1,000 gallons in the tank.

(b) A dip sample was found to contain .215 per cent. arsenious oxide. What correction must be made for 7 day dipping? It is too strong and water must therefore be added. As .16 per cent. arsenious oxide is the standard for weekly dipping, the given dip contains .055 per cent. arsenious oxide too much. According to the table for seven day dipping 62.5 gallons of water must be added to each 1,000 gallons of fluid for each .01 per cent. that the dip is too strong. Therefore, to bring the strength of the given dip down to the weekly standard one must add :—

$$\frac{.055}{.01} \times 62.5 = 344 \text{ (approx.) gallons of water}$$

for each 1,000 gallons of fluid in the tank.

(c) A dip sample was found to contain .285 per cent. arsenious oxide. What correction must be made for 14 day dipping? As .24 per cent. arsenious oxide is the standard for 14 day dipping, the given dip contains .045 per cent. arsenious oxide too much. According to the table for 14 day dipping 41½ gallons of water must be added to each 1,000 gallons for each .01 per cent. that the dip is too strong. Therefore, to bring the strength of the given dip down to the 14 day standard one must add—

$$\frac{.045}{.01} \times 41.5 = 4\tfrac{1}{2} \times 41\tfrac{1}{2} = 187 \text{ gallons of water}$$

for each 1,000 gallons of fluid in the tank.

Typical Problems in Tank Control.—The following are typical examples of the problems in adjustment of fluid strength which may occasionally arise :—

(1) A farmer who has been dipping at 7 day intervals desires to dip at 3 day intervals. His dipping tank has a capacity of 3,000 gallons, and is filled up to the 2,500 gallon mark with a solution of Cooper's dip which when tested is found to contain .15 per cent. arsenious oxide. How should one proceed to adjust the fluid for 3 day dipping? The dip contains .15 per cent. arsenious oxide. This corresponds to 1 of Cooper's dip in 166. The tank therefore contains 2,500 gallons of dipping fluid, each 166 gallons of which contains one gallon of Cooper's dip, *i.e.*, the tank now contains—

$$\frac{2{,}500}{166} = 15 \text{ gallons of dip,}$$

but for 3 day dipping one requires .08 per cent. arsenious oxide, which corresponds to 1 of Cooper's in 312. Therefore, when the tank is adjusted, it will contain 3,000 gallons of fluid, each 312 gallons of which will contain one gallon of Cooper's dip, *i.e.*, it will contain—

$$\frac{3{,}000}{312} = 9\tfrac{3}{5} \text{ gallons of dip.}$$

Therefore $15 - 9\frac{3}{5} = 5\frac{2}{5}$ gallons of Cooper's dip must be removed from the tank, and as one gallon is contained in 166 gallons of the fluid, $5\frac{2}{5} \times 166 = 896$ gallons of the fluid must be taken out. We may call this 900.

As the tank now contains 2,500 gallons, fluid must be removed until it stands at the 1,600 gallon mark, and then water added to fill up to 3,000 gallons.

(2) A tank has stood for a long time without attention and considerable evaporation has taken place. The total capacity of the tank is 3,000 gallons, and it is full up to the 1,400 gallon mark with a solution which is found by the tester to contain .23 per cent. arsenious oxide. How would one proceed to fill the tank up to the 3,000 mark with Champion dip of regulation weekly strength = 1 in 300? The solution at present in the tank contains .23 per cent. arsenious oxide, which (from tables) corresponds to 1 gallon of Champion dip in 208. As there are 1,400 gallons of fluid in the tank, $\frac{1{,}400}{208} = 6\frac{3}{4}$ gallons of Champion dip are at present in the tank. When made up the tank will contain 3,000 gallons of fluid, each 300 of which should contain 1 gallon of Champion dip, *i.e.*, it should contain—

$$\frac{3{,}000}{300} = 10 \text{ gallons of Champion dip.}$$

The difference between 10 and $6\frac{3}{4}$ is $3\frac{1}{4}$, so that to adjust the tank for weekly dipping one must add $3\frac{1}{4}$ gallons of Champion dip, and then fill up to the 3,000 gallon mark with water.

(3) Suppose that a man has cleaned out his 3,000 gallon tank and desires to fill up again for weekly dipping, and that he has three gallons of Champion dip and two gallons of Arsenoda

which he wishes to use up, and desires to make up to proper strength by means of arsenite of soda (80 per cent.). The three gallons of Champion dip will make up 900 gallons of fluid, and the two gallons of Arsenoda will make up 700 gallons. Thus, together they make up 1,600 gallons, leaving 1,400 gallons to be made up by means of the arsenite of soda. Arsenite of soda (80 per cent.) is used at the rate of 1 lb. per 50 gallons for weekly dipping, so that for 1,400 gallons 28 lbs. are required. Hence in the case under consideration he would add to the tank three gallons of Champion dip, two gallons of Arsenoda, 28 lbs. of arsenite of soda, and then fill up to the 3,000 mark with water.

(4) The quality of arsenite of soda recommended for dip preparations is 80 per cent., *i.e.*, it contains 80 per cent. of arsenious oxide. Sometimes inferior brands containing 60 per cent. arsenious oxide are met with, and it may be of interest to give an example shewing in what proportion these should be used.

Suppose that a 3,000 gallon tank when tested is found to contain .08 per cent. arsenious oxide. Reference to the Champion tables shews that (for weekly dipping) 10 lbs. of 80 per cent. arsenite of soda should be added for each 1,000 gallons in the tank. But we are supposing that the dip-mixer wishes on this occasion to employ a 60 per cent. brand of arsenite of soda. $\frac{60}{80} = \frac{3}{4}$ so that the 60 per cent. brand has $\frac{3}{4}$ the tick-killing power of the 80 per cent. brand. Therefore $\frac{4}{3}$ lb. of the 60 per cent. brand must be used to produce the same effect as 1 lb. of the 80 per cent. brand.

It was found above that to make the given dip up to weekly dipping strength 10 lbs. of the 80 per cent. brand must be added for each 1,000 gallons, therefore $\frac{10 \times 4}{3} = 13$ lbs. $5\frac{1}{3}$ ozs. of the 60 per cent. brand must be added for each 1,000 gallons. As the tank contains 3,000 gallons one must add 13 lbs. $5\frac{1}{3}$ ozs. $\times 3 = 40$ lbs. of the 60 per cent. arsenite to it.

Oxidation of Dips.—Under certain circumstances the arsenious oxide in the arsenite of dips tends to change into another form producing arsenate. As arsenate it cannot be estimated by the ordinary field tester. A fluid which contained arsenate only in large amount would appear to contain no arsenic whatever when "tested." Arsenate has a certain tick-killing power—said to be roughly a half that of arsenite—and at the same time it has a scalding and poisoning effect upon cattle. When a tank is in frequent use the amount of arsenate present is usually so small as to be practically negligible, but if a tank is allowed to stand for some time without use, the tendency is for the proportion of arsenate to increase. If a tank has not been used for some time, it should be tested by the tester, and then a sample sent (with a letter explaining the circumstances) for complete analysis to the Agricultural Chemist. Arsenite changes into arsenate fairly rapidly when dip is allowed to stand in a bottle, but this is easily prevented by adding to the bottle about 15 to 20 drops of sulphuric acid (acid "A" of test apparatus).

Miscellaneous.—*Gloy and Starch Solution.*—It is possible that after keeping for some time the gloy may become stale, and may not give a good colour with the iodine test solution. If this is suspected the gloy may be tested as follows:—

Put some water in the testing beaker and add to it a little gloy. Then add about one or two drops of the iodine solution. This should produce a pronounced blue colour in the water. If it does not, fresh gloy should be procured. If gloy is unobtainable at any time, starch solution may be substituted, which can be prepared as follows:—Boil a little water in a saucepan or mug, and whilst boiling add to it a paste made by grinding a little *ordinary* starch with water. Allow to cool, and then add a few drops to the dip to be tested.

Addition of Bi-carbonate.—Unless sufficient bi-carbonate (alkali D) is added, the blue colour will appear too quickly and the dip may appear much too weak. If a blue colour is obtained very quickly on introducing testing solution, it is a good plan to add a little more bi-carbonate and shake. If the blue colour remains, the true end point has been reached; if not, more testing solution should be added until the blue colour persists again.

Summary of Operations in Dip-testing.—The following concise summary of the operations in dip-testing with the Champion tester, arranged in the order in which they are performed, may be useful:—

1. Add acid 20 to 30 drops as required, shake and let stand.
2. Pour off or filter clear liquid.
3. Measure 50 c.c. clear liquid by measuring cylinder and pour into beaker.
4. Add bi-carbonate and starch (gloy).
5. Fill burette to O with testing solution.
6. Run testing solution from burette into beaker carefully till blue colour persists after thorough shaking.
7. Read burette

$$\frac{\text{No. of c.c.'s used}}{100} = \text{arsenious oxide per cent.}$$

See tables commencing page 7 of Champion booklet.

The Agricultural Chemist, Salisbury, will be pleased to give advice upon any questions relating to dip-testing.

A Mazoe Irrigation Scheme.

By A. C. Jennings, Assoc.M.Inst.C.E., A.M.I.E.E.,
Government Irrigation Engineer.

Amongst one of the schemes recently completed in this country is that on the farm Glengrey in the district of Mazoe, the property of Colonel Sir Raleigh Grey, K.B.E., C.M.G., C.V.O., regarding which, with permission, we publish the following details. At a point in the Umrodzi River, about 1½ miles above its junction with the Wengi River, a weir has been constructed from which the main irrigation canal is led out and carried for a distance of four miles along the right bank of the river.

The weir is very favourably situated at the head of a natural waterfall which has a drop of about 28 feet. The wall of gravity section is founded throughout on a solid granite outcrop and is built in uncoursed rubble masonry set in cement mortar, and has a base thickness of about six feet. The upstream face is vertical, and the downstream face battered 1 in 5 to a top width of four feet, the total height above lowest foundation level being about 10 feet. The total length along the top of wall is 230 feet and the basin formed by the weir backs up stream about a quarter of a mile, thus forming a reservoir of considerable capacity.

Two outlet pipes each of 12 inches internal diameter and fitted with cast iron gate valves are provided in the base of the wall, and are carried for a short distance downstream, where they discharge into the head of the main canal, which soon passes out of reach of high flood level. The canal, having a bed width of 3 feet and discharge capacity of about 6 cubic feet per second, follows the general contour of the valley, and has an even falling grade of 1 in 2,500. In several places rock outcrops were encountered, which involved heavy excavation work in its construction, the remainder of its length being in compact gravel and red soil.

The first land commanded is situated about 2¼ miles from the intake, from which point onwards it embraces a total area of nearly 300 acres of good land varying from rich red sandy loam to light red soil. Up to the present about 45 acres have been established under citrus trees, and of the remaining land about 30 acres are being put under winter wheat, potatoes, etc., this season.

The total cost of the scheme has not exceeded £1,800 or £6 per

Weir at Glengrey.

Main canal, Glengrey.

16

7

acre irrigated, which can be considered a low figure for works of this nature.

The close proximity of this land to the railway—being not more than four miles from Glendale Station—renders it exceedingly promising for sub-division into small mixed farms suitable for dairying, etc., and it is to enterprises of this nature that one must look for the much desired closer settlement which it is hoped will take place in Southern Rhodesia.

Notes on the Rainfall Season 1919-20 in Southern Rhodesia.

By C. L. Robertson, B.Sc., A.M.I.C.E., Hydrographic Engineer.

The rainfall during the season 1919-20 has been slightly above the average for most stations in the Territory, varying from 5 to 10 per cent. in excess for the majority, to 26 per cent. in excess at Gwelo and 31.40 per cent. below normal at Tuli. The accompanying rainfall map shews the distribution of the fall over the Territory. It has been compiled from the records received from 200 stations up to the end of March. As this is the first time a map of this nature has been published in this *Journal* it might be as well to give some explanation of it.

The totals for the various stations are allocated to their different positions on the map and then lines drawn to shew every variation of 5 inches in the total rainfall from 20 inches to 40 inches. For instance the 35 inches line was drawn so as to embrace all stations on the right of it which had a total fall of 35 inches or over in the season. Similarly the 30 inches line was drawn to embrace all stations on the right of it which had a total fall of 30 inches or over. Therefore the belt of country between the 30 inches line and the 35 inches line is the area which has received between 30 inches and 35 inches of rain during the season.

These various areas have been shaded differently so as to mark the gradation of the fall. There are a few outliers to these various areas.

For instance in the 35 to 40 inches belt there is a small area around Mtoko which received under 30 inches. In the 25 to 30 inches belt there are two areas, one extending from Que Que to the Inyoka Estate and the other including Gwelo, Lalapanzi, Selukwe, which received over 30 inches. There is also an area around Bikita in the 35 to 40 inches area which received over 40 inches. It is to be noted, however, that this is a wet area, as six years' records shew an average rainfall at Bikita of 68.22 inches, and the fall there to date has totalled 63.45 inches, which is the maximum recorded for any station in the Territory. As regards dry areas there are two outliers under 20 inches, viz., one around Wankie and one around Filabusi, both being in the 20 to 25 inches belt.

The average fall at Wankie over ten years shews a normal fall of 22.74 inches; the total to end of March for this station was only 17.01 inches. A seventeen years' average at Filabusi shews a normal fall of 20.82 inches, whilst the total to the end of March for this station was only 16.43 inches. It will be noticed that the 40 inches line has a general N.-S. direction along the mountains on the eastern border. The 35 to 25 inches lines have a general S.-E. N.-W. direction, and are approximately at right angles to the direction of the prevailing wind, the precipitation diminishing as the distance from the coast increases. The 20 inches line has a general E.-W. direction and embraces the southern Gwanda and Chibi districts. Owing to the paucity of stations in this area the exact location of the northern extremity of the 35 inches line is to be accepted with some reserve. Similarly the 20 inches line is known to run to the junction of the Lundi and Tokwe Rivers, but its eastern extremity may have a more southern direction than is shewn on the map.

For comparison of this season with previous years the following table shews the variation from the mean recorded at a few typical stations throughout the Territory:—

Station.	Total, end of March.	Yearly average.	Variation from mean.
Melsettter	44·03	46·50	− 5·3 per cent.
Umtali	30·96	33·61	− 7·9 ,,
Mt. Darwin	36·20	30·09	+16·8 ,,
Rusape	38·19	31·66	+20·6 ,,
Marandellas	37·60	35·96	+ 4·5 ,,
Salisbury	33·88	32·02	+ 5·5 ,,
Mazoe	33·56	32·54	+ 3·1 ,,
Sinoia	37·63	30·86	+21·9 ,,
Hartley	36·45	29·47	+23·7 ,,
Gwelo	35·46	26·20	+26·1 ,,
Umvuma	32·51	26·39	+23·2 ,,
Victoria	28·54	26·39	+ 8·1 ,,
Bikita	63·45	68·22	− 7·0 ,,
Gwanda	21·82	20·51	+ 6·3 ,,
Tuli	9·89	14·42	−31·4 ,,
Bulawayo	25·37	23·40	+ 8·4 ,,
Victoria Falls	32·01	27·02	+18·5 ,,

The extremes in the total precipitation are recorded from Bikita and Tuli, viz., 63.45 inches and 9.89 inches respectively. Although the season has thus been a fairly average one as regards the total precipitation, yet its monthly distribution has been irregular. This is shewn by the accompanying curves where the full lines shew the monthly fall at a few typical stations and the dotted lines the mean monthly fall for these stations.

It will be seen from these that the early rains up to end of December were slightly over the average for Mashonaland, but much below the normal for Matabeleland. There was a marked dry spell in January owing to the late arrival of the general rains. The rains set in earlier in Matabeleland than in Mashonaland. The January fall was below the average in Mashonaland, but above the average in Matabeleland. The rains continued later than usual throughout the whole country, and this is reflected in the curves where it is seen that the March fall is above the average for all stations.

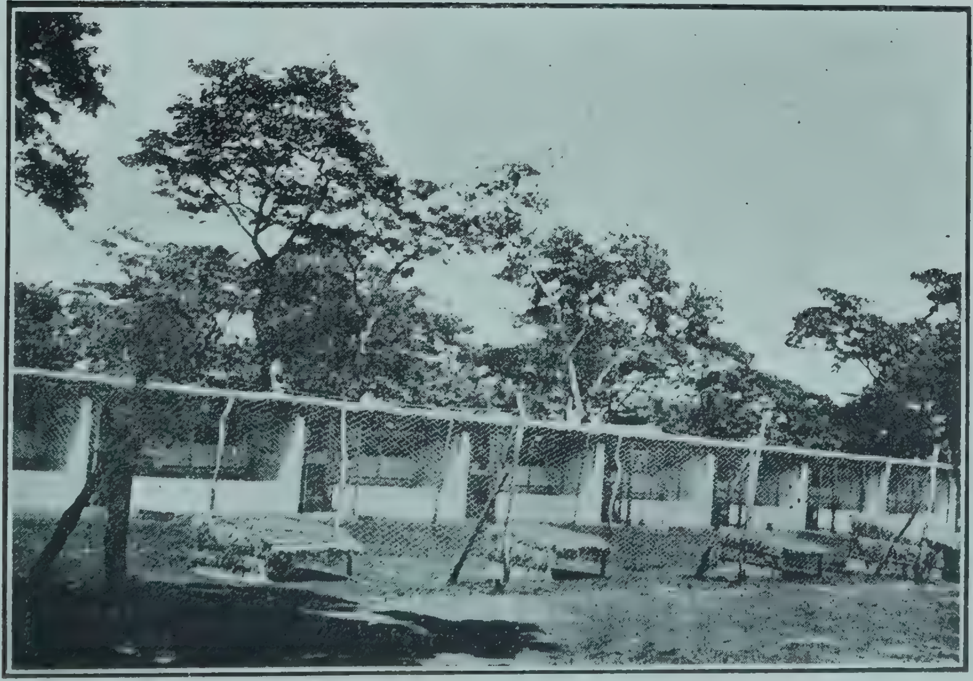
Each horizontal line represents a fall of half an inch. The fall per month is plotted on the line on which the name of the month is written. The Salisbury curve shews that the fall in October was 2.3 inches as compared to a mean of 1.2 inches. In November the fall was 4.7 inches as compared to a mean of 3.7 inches.

The First Southern Rhodesia Egg-Laying Test.

21ST APRIL, 1920, TO 2ND MARCH, 1921.—FIVE BIRDS IN EACH PEN.

Pen.	Position.	Owner.	Residence.	Breed.	21st April to 18th May (inclusive).			
					Total No. of eggs.		Total weight of eggs.	
					Above $1\frac{3}{4}$ ozs.	Below $1\frac{3}{4}$ ozs.	Above $1\frac{3}{4}$ ozs.	Below $1\frac{3}{4}$ ozs.
1	3	H. Tatham	Penhalonga	White Leghorns	86	2	11 lbs. $2\frac{1}{8}$ ozs.	$3\frac{3}{8}$ ozs.
2	8	Mrs. Walleen	Bembesi	do.	74	...	9 lbs. $\frac{15}{16}$ ozs.	...
3	1	A. Hampson	Umtali	do.	107	...	14 lbs. $5\frac{1}{4}$ ozs.	...
4	17	Mrs. Renton	Que Que	do.	37	...	4 lbs. 10 ozs.	...
5	12	A. R. Low	Gwelo	do.	39	...	5 lbs. $8\frac{11}{16}$ ozs.	...
6	15	W. Bands	Salisbury	Anconas	47	...	5 lbs. $7\frac{7}{8}$ ozs.	...
7	20	Mrs. Lloyd	Inyazura	White Leghorns	22	1	2 lbs. $11\frac{1}{4}$ ozs.	$1\frac{1}{2}$ ozs.
8	18	W. F. Williams	Bulawayo	do.	27	21	3 lbs. $\frac{11}{16}$ ozs.	2 lbs. $2\frac{1}{8}$ ozs.
9	16	Mrs. Kimpton	Umtali	do.	41	5	5 lbs. $2\frac{15}{16}$ ozs.	$7\frac{7}{8}$ ozs.
10	9	Mrs. Gibbings	Avondale	do.	57	1	7 lbs. 14 ozs.	$1\frac{1}{4}$ ozs.
11	13	H. Fretwell	do.	Rhode Island Reds	43	...	5 lbs. $8\frac{3}{8}$ ozs.	...
12	6	T. Brokensha	Umtali	White Leghorns	78	...	10 lbs. 6 ozs.	...
13	11	C. L. Brown	Salisbury	do.	45	2	5 lbs. $10\frac{3}{16}$ ozs.	$3\frac{5}{16}$ ozs.
14	7	J. S. Wreford	Bulawayo	do.	72	...	9 lbs. 11 ozs.	...
15	19	D. O'Linn	Salisbury	do.	22	1	2 lbs. $11\frac{5}{16}$ ozs.	$1\frac{11}{16}$ ozs.
16	4	A. E. Speight	do.	do.	84	...	10 lbs. $9\frac{1}{2}$ ozs.	...
17	10	Mrs. Williamson	Banket	do.	56	2	6 lbs. $12\frac{15}{16}$ ozs.	$3\frac{1}{16}$ ozs.
18	5	Bray & Bull	Umtali	do.	87	1	10 lbs. $9\frac{7}{16}$ ozs.	$1\frac{11}{16}$ ozs.
19	14	Miss Greig	Bulawayo	do.	42	...	5 lbs. $8\frac{1}{16}$ ozs.	...
20	2	Mrs. Deall	Old Umtali	do.	97	3	11 lbs. $6\frac{9}{16}$ ozs.	5 ozs.
				Totals	1,163	39	146 lbs. $13\frac{1}{8}$ ozs.	3 lbs. $14\frac{7}{8}$ ozs.

Pisé de Terre work, for poultry pens, Experiment Station, Salisbury.



Rhodesia egg-laying test—the pens.

Cotton.

With a view to aiding the development of the cotton growing industry in Rhodesia the British Cotton Growing Association has offered a sum of £262 10s. as prizes for two competitions to be held during the season of 1920-21.

The conditions of the competitions are as follows:—

(1) A cotton grower may compete in only one class.

(2) The competition will be open to cotton growers of both Southern and Northern Rhodesia.

(3) There must be at least eight competitors in the first and ten in the second competition, otherwise the prize money is to be held over for a similar competition the following year.

(4) The points for scoring will be: (a) cultural methods and handling the crop, 35 per cent.; (b) quantity or yield, 30 per cent.; (c) quality, 35 per cent.

(5) Officers of the respective Agricultural Departments will judge and score as to (a) cultural methods and handling the crops, and (b) quantity or yield, while (c) quality will be judged and scored by the British Cotton Growing Association.

(6) Samples of ten pounds of seed cotton will be taken from each competitor's crop by officers of the respective Agricultural Departments.

(7) Samples of five pounds of seed cotton will be forwarded from each competitor's crop to the British Cotton Growing Association, who will judge and score as to the quality of the lint.

(8) Intending competitors must send their names to the Director of Agriculture, Salisbury, in respect to Southern Rhodesia, on or before the 1st September, 1920.

The first competition will be for 50 acres of cotton, and the prizes will be as follows:—

1st prize, £100.
2nd prize, £50.
3rd prize, £25.

The second competition will be for ten acres or more, but less than 50 acres, and the prizes will be as follows:—

1st prize, £50.
2nd prize, £25.
3rd prize, £12 10s.

The generous action of the British Cotton Growing Association will doubtless be the means of stimulating the growing of cotton in Rhodesia, a country which, it is hoped, will henceforward contribute an increasing proportion of the cotton produced within the Empire.

Veterinary Report.

March, 1920.

AFRICAN COAST FEVER.

Gwelo District.—No fresh outbreaks. The mortality at the infected farms Clearwater and Northfield was 8 head.

Mazoe District.—No fresh outbreaks. Mortality:—Avonduur, 6 head; Rocky Spruit, 1; Sleamish, 4.

Matobo District.—No fresh outbreaks. Mortality 38 head.

Melsetter District.—At the Tarka infected centre 10 deaths occurred. A fresh outbreak occurred on the adjoining farm Springfield; one animal affected.

TUBERCULOSIS.

Post-mortem examination on a young pure-bred Shorthorn bull in Lomagundi district shewed tuberculosis; confirmed microscopically.

ANTHRAX.

One case occurred in the Mtoko district, the animal affected being a cow.

QUARTER-EVIL.

A considerable mortality reported from this disease.

EPHEMERAL FEVER (three days' sickness).

This disease was reported in several districts. No mortality.

IMPORTATIONS.

From the Union of South Africa:—Horses, 34; mules, 21; donkeys, 59; sheep and goats, 896.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 847; *via* Liebig's Drift, 26. Breeding cattle *via* Liebig's Drift, 1,392; sheep and goats, 315; horse, 1; pigs, 28. To Northern Rhodesia:—Horses, 5; mules, 4. To Portuguese East Africa:—Bulls, 3; cows, 5; heifers, 25; mules, 2; pig, 1; goats, 21.

J. M. SINCLAIR,

Chief Veterinary Surgeon.

The Agricultural Outlook.

The season ended very favourably, and reports indicate that the harvest will be up to expectations. An early forecast estimated the yield from maize at 908,000 bags, but it is possible that this total will be exceeded, as the crops in districts outside the recognised maize belt have done particularly well. The quality of the grain is excellent, and the yield per acre is probably above the average. The new maize association has shewn itself to be a live body, and the enterprising policy it is adopting should do much to gain a wider recognition of the quality of Rhodesian maize, as well as to further the interests of the members, who comprise the majority of the growers of the country.

Most of the tobacco crop has been reaped, and the quality of the leaf is generally very good. There has been a tendency to plant a larger acreage than could be dealt with by the barn accommodation provided, and the crop therefore includes a fair proportion of air-cured leaf, which of course will not realise the price of the flue-cured tobacco. In spite of repeated warnings, many growers still continue to send their tobacco to the warehouse in a "high" condition, resulting in a large percentage of mouldy leaf which is practically worthless. The area under tobacco this year is computed at 8,321 acres. The yield per acre will in all probability be higher than it was last season.

The season for harvesting cotton is now at hand, and growers should read Mr. Taylor's article on the subject, which appears in this issue.

The late rains have stimulated the growth of winter cereals, and reports state that the crops are doing well. The forecast made in the last issue of the *Journal* as to a short supply of wheat from the usual sources is confirmed by the daily Press. It is hoped that with the favourable conditions prevailing this winter a large acreage will be planted to wheat, for which good prices may be expected. It may be mentioned that our imports of wheat and wheaten flour during 1919 amounted to £68,906, a figure which we hope to see considerably reduced.

There is an increasing demand for agricultural machinery and implements, but considerable delay is being experienced in executing orders in the United Kingdom and America.

Grass is everywhere luxuriant, and the late rains, which fell in most parts of the Territory, considerably improved the hay crop. Early grazing may be expected, and the prospects for the winter season are good. Cattle are everywhere doing remarkably well, and the census for the year 1919, which will probably be published in our next issue, will shew marked increases. The numerous sales throughout the Territory are well patronised, and prices, especially for improved breeding stock, are ruling high. The export of slaughter stock to the Union is being maintained, while the canning factory at Odzi is absorbing a large number of surplus stock. The canned products from the factory are finding a ready market in the Territory. The demand for dairy cattle is strong, but good milking stock is difficult to obtain. It is pleasing to note that we are now supplying a much larger proportion of our requirements of butter. For instance, our imports of butter in 1919 were £14,860 less than they were in 1918. With the appointment of a Dairy Expert to the Department of Agriculture, it is hoped to devote more attention to dairying matters in the pages of this *Journal.*

Soil erosion and the drainage of wet lands are matters which a succession of somewhat heavy wet seasons has brought into prominence, and the advice of the Department of Agriculture in regard to these matters is being freely sought. Irrigation is assuming greater importance in the agricultural practice of this Territory, and a number of schemes, which will bring considerable areas under water, are being considered.

Farming Calendar.

June.

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued and pruning taken in hand towards the end of the month. Washington Navel oranges and some earlier varieties will be ready this month for gathering, packing and despatch.

CROPS.

The harvesting of the smaller crops will now be over, except possibly pea-nuts, mangels and dhal. Pea-nuts should be lifted before the first frosts if possible. Mangels may safely be allowed to remain in the ground until required for use; or, if harvested, should not be heaped, but spread thinly on the ground at a convenient spot. Dhal will not be ripe until the end of the month, when the plants should be cut about a foot above the ground, allowed to dry for a few days, then shaken to free the seeds from the pods. Ploughing should be continued through the month if possible, and, if the maize is cut and stooked on the side of the lands, the maize fields should be ploughed to keep down such pests as the stalk borer. Winter crops of wheat, oats and barley will not require much attention. As a rule, where water is plentiful, too much irrigation is practised. One application per month will generally be found sufficient for the above crops.

DAIRYING.

With the advent of the winter months, dairy produce is not so liable to perish as in the hotter months. Cream producers can with advantage produce cream for the factories containing a slightly lower fat percentage, as cream is not so likely to go sour on account of lower atmospheric temperatures. With regard to next season's milk or cream supply, dairy farmers must ensure that the dairy cows are kept in good condition throughout the winter months, so that they can produce milk immediately after calving, and not require the first two months' fresh grass to bring them into condition, thereby losing what should be the best weeks of their production. A cow gives her utmost in milk from four to six weeks after calving, but she must be in good condition to do this.

DECIDUOUS FRUITS.

Pruning of deciduous trees should be done this month or in July.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in boxes in a warm place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

FORESTRY.

Burn out the grass in any fire traps round or near the plantation that were left unploughed. Any timber that is to be felled should be taken in hand this month.

GENERAL.

Grazing in drier districts is beginning to give out, and steps should now be taken to ensure that some good veld in the neighbourhood of the water is preserved for future use. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

During the sudden cold snap in May many poultry keepers complained of sudden cessation of eggs; this always happens during a cold spell and can be remedied by keeping the birds warmer at night. Houses open on one side only (the front), and all must be provided with a canvas blind (old sacks sewn together will do) which can be let down as soon as the sun sets on cold nights, thus keeping the birds snug and warm during the night; no food which previously went to produce eggs is thus required to maintain the body heat. Those who study this point during cold weather will profit considerably by a continued egg supply. The notes with reference to chickens for the months of April and May are similarly applicable to June and July; avoid overcrowding, keep them growing without any check, with plenty of exercise and fresh air, and your labour will be amply rewarded by good, vigorous, profitable birds later.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives; those who have not much time to spare should see the work is carried out properly. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left you will have unfertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

STOCK.

Cattle.—There is every indication of a good winter season for horned stock, and ranching cattle should not give much trouble. Dipping is best postponed during very cold snaps until a warm day occurs. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground-nuts, ground-nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—As most vleis are still very wet, sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beans should be staked and tied. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. After twelve months in this Territory, sheep do not contract the disease. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

Orange trees should be pruned this month, if this work is not completed. Groves must be well cultivated, especially after irrigation has taken place, and the soil round the trees hoed or dug over. Washington Navels will be gathered and some later varieties will be ready for picking. The irrigation of orange trees should be taken in hand when the trees are ready to commence the next growth.

CROPS.

See June.

DAIRYING.

See June.

DECIDUOUS FRUITS.

Pruning may be done this month.

ENTOMOLOGICAL.

Onions.—Thrip is liable to affect this crop, and when present calls for careful attention. Tobacco wash or paraffin emulsion should be used.

Deciduous Fruits.—Scale infested trees may receive a winter wash during this month. Lime sulphur salt wash or scalecide is recommended for this purpose.

Guava.—Citrus growers should always bear in mind that this fruit harbours citrus codling when there is no citrus fruit available. All guava trees, therefore, in the vicinity of citrus orchards should be stripped during this or next month, and the fruit buried deeply or burnt.

Fig.—Fig weevil may still be in evidence. The fruit is also sometimes attacked by citrus codling and other moths. The destruction of infested fruit is the most practical remedy for the pests.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. Pruning, if not already done, should be attended to early. Dahlias and other summer-flowering bulbs should be taken up and stored for division and replanting whilst the soil is being prepared. Sweet peas require attention and staking.

FORESTRY.

Cuttings of all ornamental shrubs, roses, etc., should be taken now before the spring growth starts. Plants grown in tins during the previous season should be re-potted as soon as the cold weather is over.

GENERAL.

Veld fires are now liable to occur, and must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

We shall continue to have cold nights this month also; therefore, to keep the birds laying, warmth at night is necessary, and measures as given for June should still be adopted. Remember that a bird will go off laying if not attended to properly, much more quickly than it is possible to get her laying again.

Continue to watch the chicks, keep them growing without any check, and above all, do not overcrowd at night; a little extra care given to them will amply repay you later, with strong, healthy, vigorous, profitable stock.

No eggs should be hatched after August; such chicks take much longer to develop and are usually weedy and very unprofitable; therefore hatch as many as you can this month and the next; the early hatched cockerels that do not shew good qualities should by this time have been killed or sent to market *for killing*, and thus more room, time and food will be available for the pullets and profitable cockerels.

Do not forget that deep litter in which all grain should be buried to induce scratching exercise is absolutely necessary to produce strong, healthy, profitable chicks and adult birds. This is a point that most poultry keepers omit, with most unprofitable and often fatal results, for the birds become lazy and very fat, and a fat bird lays many less eggs than one in good, hard, lean condition; the eggs she does lay are more unfertile, chicks are weaker, and she is also more liable to liver disease and apoplexy. A bird cannot be given too much scratching exercise.

Turkeys should be laying well now; set every egg produced, and for rearing and care of turkeys, refer to the April issue of the *Journal.*

Hatch too as many ducklings as possible before the hot weather commences; they are more difficult to rear in such weather, and the hot sun is fatal to them. If you want duck eggs, go in for the Indian Runner; if eggs and meat, the Pekin; if table ducks only, the Aylesbury; and remember that breeding ducks *must* have water for swimming, if the eggs are to be strongly fertile. Ducklings reared for killing should be kept quiet in a small run, and no water except for drinking purposes.

STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor. Dairy cattle will require heavy feeding now, and if plenty of roughage is available, cows in milk will do better if kept in for a while on cold mornings and turned out only after the warmth of the sun is felt.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none are looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

Weather Bureau.

RAINFALL.

STATION.	1920.		Seasonal to date.
	March.	April.	
MASHONALAND—			
Charter—			
Buhera	8·28	0·27	38·92
Bushy Park	6·22	0·20	28·16
Enkeldoorn Gaol	8·43	0·01	32·58
Range	8·06	0·07	33·88
Wylde Grove	7·24	0·09	31·76
Chilimanzi—			
Central Estates	6·14	0·12	31·41
Driefontein	5·14	0·14	29·12
Felixburg	8·06	0·19	36·98
Induna	4·44	0·12	34·19
Grootfontein (n.s.)	4·93	...	—
Darwin—			
Mount Darwin	8·74	1·40	37·58
Gutu—			
Eagle's Nest Ranche	10·04	0·44	40·41
Gokomere	7·52	0·69	30·79
M'vimvi Ranche ...	10·24	0·10	40·06
Hartley—			
Beatrice (B.S.A.P.) ...	7·24	...	35·17
Carnock Farm	8·60	...	—
Cringleford	8·64	...	37·58
Elvington	5·19	0·06	35·61
Gatooma	4·56	...	31·07
Gowerlands	7·64	...	36·96
Hartley Gaol	2·44	...	31·24
Hopewell	5·19	...	29·13
Ranwick	2·80	...	27·50
Shagari (Chevy Chase) ...	3·18	...	26·63
Spitz Kop	5·17	...	22·50
Kujary	7·93	0·04	—
Inyanga—			
Rhodes Estate	6·42	0·95	46·59
St. Trias' Hill	7·89	0·40	39·75
Lomagundi—			
Argyle	4·03	0·80	37·36
Darwendale	5·50	0·10	28·92
M'Vaumi Farm (n.s.)	9·56	1·95	—
Eldorado (Railway)	2·85	...	—
Gambuli (Mukore)	4·43	0·99	36·32

RAINFALL—(*Continued*).

Station	1920.		Seasonal to date.
	March.	April.	
Mashonaland—(Continued)			
Lomagundi—continued			
Lone Cow Estate	5·67	0·28	33·85
Longmead	5·48	0·41	39·24
Mukwe River Ranche	4·70	0·38	34·73
Palm Tree Farm	7·89	0·50	42·45
Sinoia	6·21	0·23	37·86
Makoni—			
Delta	8·97	0·07	34·41
Eagle's Nest Ranche	13·64	...	40·25
Forest Hill	12·43	0·62	43·16
Gorubi Springs	8·90	0·39	36·58
Mona	12·13	0·64	45·98
Monte Cassino Mission	10·06	...	39·70
Springs	11·56	0·39	39·99
Marandellas—			
Bonongwe	10·08	0·14	31·18
Huish Estate	8·24	0·12	29·22
Land Settlement Farm	7·12	...	28·33
Marandellas (Railway)	9·55	...	37·60
Nelson	7·38	0·11	22·03
Selous Nek	5·70	0·45	37·40
Tweedjan	10·00	0·40	35·82
Mazoe—			
Avonduur	11·38	1·16	44·91
Bindura	10·82	1·12	37·66
Ceres	9·33	1·87	47·00
Chipoli	12·34	1·08	40·65
Citrus Estate	4·92	2·61	37·02
Dunmaglas	5·88	1·05	29·80
Kingston	9·98	1·11	38·50
Protea (n.s.)	7·58	0·31	—
Lowdale	5·43	1·53	35·43
Mazoe Dam	4·63	1·19	37·91
Mguta Valley	3·64	0·24	29·19
Omeath	5·72	0·35	36·46
Ruoko Ranche	7·80	0·72	35·93
Shamva Mine	9·68	0·87	40·69
Sunnyside	6·78	1·40	42·41
Teign	6·59	1·64	47·88
Virginia	8·83	1·22	40·02
Volynia Ranche	6·35	2·00	42·29
Melsetter—			
Brackenburg	12·69	2·08	54·74
Mount Selinda	10·37	3·73	56·40
Tom's Hope	7·32	0·99	49·30
Mrewa—			
Glen Somerset	9·37	0·17	41·83
Mtoko—			
Makaha	13·56	...	45·39
Mtoko	6·30	0·10	26·81

RAINFALL *(Continued).*

STATION	1920.		Seasonal to date.
	March.	April.	
MASHONALAND—(Continued)			
Ndanga—			
Doornfontein	9·89	0·94	—
Salisbury—			
Avondale	4·14	0·20	35·90
Borrowdale (Hatcliffe) ...	7·68	0·07	37·55
Bromley	9·99	...	37·73
Chishawasha	8·79	0·08	44·46
Cleveland Reservoir	8·96	0·09	39·32
Goromonzi	10·56	...	47·61
Hillside	5·07	0·03	—
Meadows (The)	9·81	0·11	34·54
Salisbury (Railway)	4·31	0·03	30·60
Stapleford	5·34	0·39	42·44
Vainona	7·66	0·35	38·23
Umtali—			
Chiconga	10·52	0·32	—
Muromo Ranche	9·62	0·10	28·80
Premier Estate	8·35	0·22	33·91
Stralsrund	6·46	0·37	31·82
Reservoir, Umtali Municipality ...	6·99	0·92	34·81
Stapleford	11·12	1·97	61·39
St. Augustine's Mission ...	7·09	0·73	38·27
Umtali (Gaol) (n.s.)	7·46	0·29	—
Odzani Power Station ...	7·44	0·62	33·90
Utopia	6·14	0·10	29·25
Odzi Drift...	9·86	0·68	36·23
Victoria—			
Clipsham	6·13	1·07	29·67
Stanmore (n.s.)	6·37	0·54	—
Zichidza Mission	9·98	1·05	39·17
Makorsi River Ranche ...	4·90	1·55	33·94
Silver Oaks	3·95	1·04	28·58
Summerton	5·44	0·11	22·78
Victoria	4·42	0·76	29·30
Riverdene North (n.s.) ...	5·59	0·67	—
MATABELELAND:			
Belingwe—			
Bickwell	1·61	0·95	22·35
Tamba	3·42	0·34	20·76
Belingwe (n.s.)	2·60	1·07	—
Bulalima-Mangwe—			
Figtree	2·26	0·15	27·22
Garth	2·71	0·13	27·69
Plumtree Public School ...	3·01	0·45	—
Solusi Mission	1·51	...	27·51
Tjompani	3·09	...	29·46
Bulawayo—			
Keendale	2·99	0·01	25·40
Saw Mills (Railway)	1·70	...	—
Umgusa	3·35	...	27·92

RAINFALL *(Continued)*.

STATION	1920.		Seasonal to date.
	March.	April.	
MATABELELAND—(Continued)			
Gwanda—			
Gwanda (Gaol)	2·44	0·43	22·25
Mtshabezi Mission	2·32	0·24	25·61
Gwelo—			
Daisyfield	4·10	...	27·44
Dawn	2·09	...	28·32
Globe and Phœnix Mine	3·86	...	32·20
Gwelo (Gaol)	2·05	0·08	35·54
Lovers' Walk	4·87	...	34·88
Oaklands	5·68	0·53	34·90
Rhodesdale Ranche	4·40	0·03	24·69
Riverdale	4·45	...	31·89
Sikombela Farm	6·72	...	36·94
Insiza—			
Albany	2·23	0·34	21·88
Filabusi	1·36	0·32	16·75
Fort Rixon	3·11	0·39	—
Inyezi Farm	2·76	0·44	22·96
Roodeheuvel	3·47	0·29	31·20
Thornville	3·18	0·45	26·00
Matobo—			
Matopo Mission	4·07	0·58	30·56
Rhodes Matopo Park	2·27	0·11	25·88
Nyamandhlovu—			
Edwaleni	1·63	...	28·56
Kalaka	1·53	...	22·60
Naseby Farm	0·95	...	27·60
Nyamandhlovu (Railway)	3·13	...	25·30
Sebungwe—			
Gokwe	4·98	...	33·44
Selukwe—			
Hillingdon	7·73	0·57	38·00
Selukwe (Railway)	6·22	1·35	36·21
Rio	4·45	0·25	28·76
Umzingwane—			
Essexvale	4·24	1·81	28·65
Ntabenende	2·79	0·36	28·50
Wankie—			
Ngamo (Railway)	2·13	...	27·89
Victoria Falls	3·70	...	35·71

... means nil.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1920		
			June	July	August
Bembesi	Queen's Mine Hotel	V. C. Andrews	4	2	6
Bindura	Bindura	G. Askew	12	10	14
Bromley	Bromley	C. J. Shirley	3	1	5
Charter—Mgezi	Farmers' Hall, Beatrice	W. Krienke	24	29	26
Central	Umvuma	W. A. James	26	31	28
Darwin	Darwin	H. Wessels	13	11	8
Eastern Border (South Melsetter)	Helvetia	—	11	9	13
Eastern Districts	Good Hope Farm	G. F. Robertson	12	10	14
Enterprise	Various farms	R. Philip	2	7	4
Felixburg—Gutu	Glenary Farm	D. R. Pyewell	..	10	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	H. Charles	5	3	7
Gatooma	Gatooma	—	No	dates	fixed
Gazaland	Chipinga	J. Myers	1	..	29
Greystone	Various farm houses, Shangani	M. Kerr	12	10	14
Hartley	Hartley	J. de L. Nimmo	26	31	28
Headlands	Headlands	J. Grewar	No	dates	fixed
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. W. Twilley	12	10	14
Insiza—Shangani	Shangani	C. H. Lewis	19	..	21
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	12	10	7
Inyazura	Inyazura	H. B. Curling	16	21	18
Iron Mine Hill	Iron Mine Hill	T. Irving	12	10	14
Lalapansi	Lalapansi	B. J. Ingle	19	17	21
Lomagundi	Sinoia	J. G. Clarkson	..	..	..
Macheke	Macheke	W. L. McLean	No	dates	fixed
Makwiro	Makwiro	D. M. Syme	16	21	..
Makoni North	Makoni	J. G. Monckton	26	31	28
Makoni	Rusape	R. C. Maclagan	12	10	14
Marandellas, Northern	Marandellas Farmers' Hall	J. Thackara	5	3	7
Marandellas, Southern	Inoro	J. Gibberd	2	7	4
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	2	7	4
Mashonaland, Western Section	Various	J. W. Dunlop	No	dates	fixed
Matopo Branch, R.L. and F.A.	Sibali	—	No	dates	fixed
Mazoe	Glendale Siding	Mrs. Yoxall West	9	14	11
Melsetter North	Various farms	N. N. Rutherfurd	26	..	
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	11	9	13
Northern Umtali	Farm Summerfield	A. Tulloch	26	..	..
Norton and District	Norton Store	W. Wrench	5	3	7
Que Que	Que Que	E. J. Ross	19	17	21
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	11	9	13
Selous	Various farms	A. L. Douglas	19	17	21
Selukwe	Selukwe	E. E. Somerset	No	dates	fixed
Shamva	Shamva	Capt. N. Stanley Stallard	..	28	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	..	..
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	12	10	14
Umtali	Royal Hotel, Umtali	J. S. Holland	3	1	5
Victoria	Victoria	—	4	2	6
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	12	10	14

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W M. Watt.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 296. Citrus Nursery Work, by A. G. Turner.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.
No. 305. Manure Supplies, by E. V. Flack.
No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.
No. 315. Descriptive List of Trees and Shrubs at Forest Nursery.
No. 320. Maize Grading, by C. Mainwaring.
Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-1919, by H. G. Mundy, F.E.S., and J. A. T. Walters, B.A.
No. 344. Ensilage, by J. A. T. Walters, B.A.
No. 348. Statistics of crops grown by Europeans in Southern Rhodesia for the season 1918-19, by F. Eyles, F.L.S.
No. 351. Improvement of Rhodesian Pastures, by H. G. Mundy, F.L.S.
Botanical Specimens for Identification.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 106. Cultivation and Preparation of Ginger.
No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. G. Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops unsuitable to Southern Rhodesia conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.

No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.
No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.
No. 327. Linseed, by C. Mainwaring
No. 333. Tobacco Culture—Field Operations, by H. W. Taylor, B.Agr.
No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 339. Tobacco Culture; Harvesting and Curing, by H. W. Taylor, B.Agr.
No. 346. Tobacco Culture—Grading on the Farm, by H. W. Taylor, B.Agr.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.
No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.
No. 291. Cutworms, by Rupert W. Jack, F.E.S.
No. 295. Tsetse Fly in Southern Rhodesia, 1918, by Rupert W. Jack, F.E.S.
No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.
No. 347. Tobacco Pests of Rhodesia, by R. W. Jack, F.E.S.
No. 353. Further Experiments with Poisoned Bait on Maize-Lands, by R. W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 82. Difficult Parturition of the Cow, by C. R. Edmonds, M.R.C.V.S., G.V.S.

No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 272. African Coast Fever: Schedule of Outbreaks to 1916, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.
No. 312. Anthrax, by C. R. Edmonds, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
No. 316. Inoculation of Cattle against Redwater and Gall-sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 324. Infectious Abortion of Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
Services of Government Veterinary Surgeons.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

No. 330. Poultry Keeping in Rhodesia—Incubation, by A. Little.
No. 331. Theory and Practice of Feeding Cattle in Southern Rhodesia, Part I., by R. C. Simmons.
No. 332. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part II., by R. C. Simmons.
No. 335. Poultry Husbandry : The Rearing of Chicks, by A. Little.
No. 336. Butchering and Flaying.
No. 337. Poultry Diseases : Enteritis, Tuberculosis, Coccidiosis.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 340. Notes on Theory and Practice of Feeding Cattle in Southern Rhodesia, Part III., by R. C. Simmons.
No. 343. Poultry Husbandry; Breeding and Selection for Increased Egg Production, by A. Little.
No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, by R. C. Simmons.
No. 350. The Basis and Beginning of Poultry Keeping, by A. Little.
No. 352. African Coast Fever, by L. E. W. Bevan, M.R.C.V.S.
No. 355. Poultry Husbandry—Principles of Breeding and Mating, by A. Little.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 205. Home Butter Making, by R. C. Simmons.
No. 226. Classification of Clouds.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
No. 328. Pont l'Eveque Cheese, by J. B. Fisher, N.D.D.
No. 329. Gervais Cheese, by J. B. Fisher, N.D.D.
No. 349. The Hydraulic Ram, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 354. The Home Orchard, by A. G. Turner.
Malarial Fever : How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Irrigation—Advice.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

A. H.—Intending settler sailing from England in June wishes hear of established farmer willing take him as pupil for 12 months' training. Has one son aged 14, who will accompany him.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 212 of 1920.] [30th April, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 35 of 1920, and, in terms of section 17 of Government Notice No. 21 of 1917, declare the following area of infection and guard area in lieu of those fixed by the first-mentioned notice :—

UMTALI NATIVE DISTRICT.

(a) *Area of Infection.*

The farms N'Odzi and Nyagari.

(b) *Guard Area.*

An area bounded by and including the following farms :—"B" Farm, Umtali Mission, Fairview, Durris, Penhalonga Valley, Tyrconnell, Forest Farm and Imbeza Plots.

No. 273 of 1920.] [21st May, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 79 of 1920, and in terms of section 17 of Government Notice No. 21 of 1917, declare the following area of infection and guard area in lieu of those fixed by the first-mentioned notice :—

MATOBO NATIVE DISTRICT.

(a) *Area of Infection.*

An area bounded by and including the following farms :—Springvale, Tati Outspan, de Hoop, Forwards, the eastern boundary of Forwards to the Ove River ; thence down this river to the north boundary of Ove North ; thence along the north-western boundary of Ove North, the northern boundaries of the farms Gumella, Undza, Mavuli and Store, the southern boundary of Famookwe to the Shashani River ; thence by and including the farms Famookwe, Mount Francis, Warneford, Darnaway, Lydeard, Shashani, Hannayvale, Sargeants and Springvale B.

(b) *Guard Area.*

Bulawayo, Matobo, Gwanda and Bulalima-Mangwe Districts.

An area bounded by and including the following farms :—Honeybird Kop, Irene, Collaton, Lucydale, Gladstone, Mineral King, unalienated Matopos; thence by and including Manyoni, Sibuntuli, Luma, Natisa, Toko North, Toko No. 2, Damara, Reserve, Nsambaan, Makwe, Makwe Reserve, Tocher, Connemara, Msulungwe, Hulughwesi, Lyndhurst, Lismore, Adhlana, Montana Vista, Shashani Reserve, Mount Pleasant, Guswini, Reserve, Taylor's Block, Liyana, Jim, Clipstone, Aliwal, Apology, Cliveden, Shaws, Klipfontein, Dawsons, Garth Farm, Hobort, Maholi, Seringa Vale, Mananda, Manda, Sherwood, Pandis, Sandown South, Kalanga, Elstobs, Centenary Mission and Doublevale.

No. 274 of 1920.] [21st May, 1920.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 566 of 1919, and, in terms of section 17 of Government Notice No. 21 of 1917, declare the following area of infection and guard area in lieu of those fixed by the first-mentioned notice :—

GWELO NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Clearwater and Northfield.

(b) *Guard Area.*

An area comprising the following farms: Redfields, Irene, Orphens, Beere Manor, Melrose, Zoe, Limeridge, Nettlethorn, Kingswood, Foxton, Harston, Deanfield, Braehead, Headwaters, Bendhu, Strathfillan, Long Valley, Bosch Kloof, Barkley, Turffontein, Barton Adair, Cross Roads, Wegdraai, Krom River and The Caillich.

No. 183 of 1920.] [16th April, 1920.

WATER ORDINANCE, 1913.

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
J. Struthers	Msali	Victoria	Farm Dromore

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 247 of 1920.] [7th May, 1920.

UNDER and by virtue of the powers vested in me by section 27 of the "Water Ordinance, 1913," I do hereby cancel Government Notice No. 400 of 1914 and appoint the under-mentioned gentlemen as unofficial members of Water Courts :—

L. Black	Salisbury
Major W. J. Boggie, M.L.C.	Gwelo
M. E. Cleveland	Salisbury
B. I. Collings	Salisbury
C. A. Dimmock	Lomagundi
J. A. Edmonds	Salisbury
J. T. English	Umtali
R. le S. Fischer	Headlands
A. S. Gifford	Melsetter
Capt. G. H. Gordon	Lomagundi
R. L. Gray	Mazoe
P. H. Gresson	Salisbury
H. Harper	Victoria
T. B. Hulley	Umtali
H. M. Huntley	Bulawayo
M. Inge	Lomagundi
J. McChlery, M.L.C.	Salisbury
J. Meikle	Umtali
T. Meikle	Bulawayo
Geo. Mitchell	Bulawayo
H. U. Moffat, M.L.C.	Bulawayo
A. L. R. Morkel	Mazoe
Capt. J. M. Moubray	Mazoe
E. Scott	Mazoe
A. N. M. Strickland	Umtali
J. Struthers	Victoria
D. Vincent	Bulawayo
W. W. Watkinson	Hunter's Road
J. Watson	Arcturus
A. E. White	Gwelo
J. H. Williams	Victoria
G. C. Woodforde	Gatooma

DRUMMOND CHAPLIN,
Administrator.

No. 267 of 1920.] [21st May, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
Mrs. G. M. Hulley	Whana	Gwelo	Farm Dopton

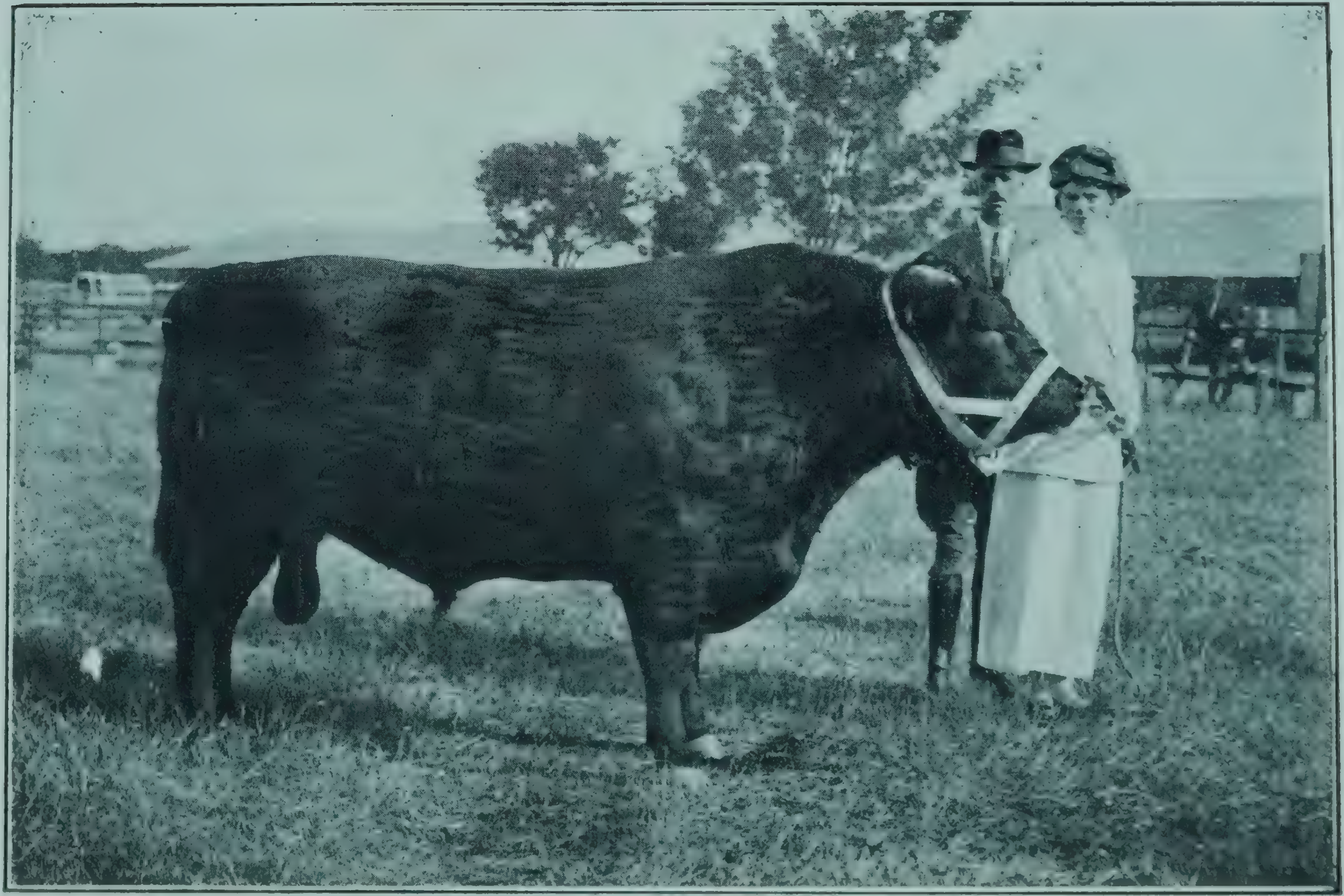
Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

RATES FOR AGRICULTURAL PRODUCE.

THE Beira and Mashonaland and Rhodesia Railways announce that with effect from 1st May, 1920, the rate of ¼d. per ton per mile, plus 1s. 8d. per ton terminal, for agricultural produce specified in clause 71, section 3 (a) of Goods Tariff Book No. 11, forwarded from Rhodesia to stations between Palapye Road and Vryburg (both inclusive) will be withdrawn and the following scale substituted :—

1 to 224 miles, 1d. per ton per mile.
225 to 575 miles, 18s. 8d. per ton.
576 miles and over, the rate as for 575 miles, plus ½d. per ton per mile.

These amended rates are subject to the surcharge of 25 per cent.



"County Magistrate," winner of 1,000 guineas trophy, Bulawayo, 1920.
Owned by Messrs. Drummond Forbes & Freeze.

THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture,
assisted by the Staff of the Agricultural Department.

PUBLISHED BI-MONTHLY.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

Horse-Sickness.—We would draw attention to the editorial notice appearing in our issue for April intimating that a limited quantity of virus vaccine was available for the inoculation of horses up to the age of two-and-a-half years, or, in other words, horses not possessing any permanent incisor teeth. It is felt that this fact should not be overlooked by farmers and owners of horses who desire to build up the horse breeding industry in this country, which, in the opinion of many well qualified to judge, it is in many respects pre-eminently suited for. Until a method of inoculation has been found which can be applied to horses of greater age belonging to the public with almost complete safety, Mr. Bevan, the Government Veterinary Bacteriologist, wishes to avoid any unnecessary risk or cause for dissatisfaction, for it is realised that, apart from the actual risk of inoculation, grave danger of unfortunate results is associated with the careless manner in which some owners treat their animals. It is his wish that no premature announcement should be made, and he prefers to err on the side of safety rather than to embark upon a course which might become discredited through no fault of his. It is satisfactory, however, to be able to record that within the last few weeks he has had under inoculation some sixty horses recently imported from the Union as remounts for the Police. These animals varied in age, but the average was about six-and-a-half years. Many of them were by no means suitable subjects for inoculation, being in poor condition, and in some cases having only recently recovered from strangles and common colds contracted on their journey to this country. Of these animals, only three died under inoculation, and it is thought that one of the three was infected naturally before treatment. This is a great improvement on any previous results, and it is hoped that the experience gained from what may be regarded as an experiment will hasten further progress and eventually place the method on a basis of safety, when it can be applied to privately-owned animals.

A pleasing factor about the process is the degree of resistance which it has been proved the inoculation conveys to treated animals, as evidenced by the fact that of 214 inoculated Police horses exposed throughout the country at all times and at all places during the past horse-sickness season, only one animal succumbed from natural infection.

Imperial Forestry Conference. During the month of July an Empire Forestry Conference was held in London. The results of this conference are likely to have far-reaching effects. Notwithstanding the fact that for the past fifty years or more Forest Officers have been calling attention to the depletion of the world's timber supplies and suggesting afforestation on an extended scale, very little response was made not only by the Mother Country, but the various parts of the Empire as well. The Great War brought the subject into prominence, and it began to be realised that timber is one of the props of the Empire. During a critical stage of the war the Welsh coal mines were with difficulty supplied with pit timber from French forests. So as to obviate importing timber into the United Kingdom at a time when ships may be required for other purposes, it is proposed to afforest land on a scale sufficient to ensure a three years' supply of home-grown timber.

At the Forestry Conference data were produced indicating the forest resources of all parts of the Empire, and methods devised of co-ordinating the forest products of the Empire so that as far as possible national needs may be supplied from national resources. Southern Rhodesia was represented at the Conference, and an inventory has been prepared dealing with the forest resources of this Territory. When the proceedings of the Conference are published we hope to make further reference to the matter.

Amended "Water Ordinance, 1920."—For some years it has been apparent to those who have had to deal with the "Water Ordinance, 1913," that it did not go far enough in principle, and that some amendment was necessary. The defects became more pronounced as time went on and the number of grants increased. All these grants were issued with the proviso that they were subject to the rights of all upper proprietors. Grant holders had thus no guarantee that the quantity of water originally allotted to them would be permanently maintained. This was a serious matter for proprietors who might have incurred relatively large capital expenditure on the construction of irrigation works and later on found that water was not available to the full extent expected; in fact, it was foreseen that we would soon reach such a position that there would not be sufficient water available as normal flow to satisfy all the rival claimants. Infinite sub-division of the water available would not solve the problem, as the portion allotted to each would be too small to be capable of being applied for irrigation purposes. The amended "Water Ordinance, 1920," was drafted to attempt to overcome this difficulty.

The principal changes in the amended Ordinance, which was passed at the recent session of the Legislative Council and now awaits promulgation, are:—

1. In future all applications for the use of water are to be referred to a Water Court, which will decide the amount of the grant.
2. The principle of priority of grants is adopted, *i.e.*, as laid down in section 15:—"If at any time the volume of water to which rights of use have been granted should prove insufficient to satisfy all such rights, no holder of any such rights shall be entitled to exercise the same until the rights of prior holders shall have been satisfied. For the purposes of this section, priority of lodging applications in terms of section 12 of this Ordinance shall give priority of right."
3. The Water Court in authorising the use of water will fix a time within which the necessary works must be constructed. Once these works are constructed and approved the grant becomes absolute, and can only be cancelled in the event of the Water Court being satisfied that the grant has not been beneficially used for a consecutive period of years.

The intention thus is only to apportion water to proprietors of *bona fide* schemes which they mean to construct within a reasonable period. In addition, there have been certain amendments to the sections in the original Ordinance dealing with combined schemes. In this connection the compulsory principle has been adopted, viz., if the proprietors of not less than two-thirds of the total irrigable area affected by a combined scheme agree to such scheme, then the minority one-third may be compelled to come into such scheme.

Redwater and Gallsickness.—We are pleased to record that there has been an increasing demand for material for the inoculation of cattle against these diseases, which in the past have not only seriously handicapped the improvement of our stock owing to the heavy mortality of better bred cattle imported for the grading up of our herds, but have retarded the growth and early maturity of bovines bred in this country. The greatest demand for this material has come from our most progressive stock owners, men who, as a result of their enterprise and forethought, have bred up a high class of animal and at the same time have rendered their farms comparatively free from ticks, so that stock reared upon them have grown up susceptible to tick-borne infections when removed to areas where the process of dipping is not so well advanced.

By the inoculation of calves they are rendered immune to redwater and gallsickness at that stage of their lives when they can best tolerate infection, so that they can subsequently be purchased by others desiring to improve the quality of their herds without the risk of loss. The process is a simple one, and no ill effects have yet been noted; on the other hand, most favourable results have been reported.

It is not suggested that this method shall in any way supplant regular and systematic dipping; it is merely intended to supplement it. It is felt that in this way the danger of the transition period through which the country is passing, when some farms are tick-infested and others have been rendered "clean," may be tided over.

United Tobacco Companies' Prizes (1920).—The United Tobacco Companies last year offered prizes amounting to £100 to members of the Rhodesia Tobacco Co-operative Society producing crops of 5,000 lbs. and upwards. The competition applied to the 1918-19 crop, and the awards, which were announced at the recent annual general meeting of the Society, were as follows:—

1. Mr. Trevor Fletcher, Norton Siding.
2. Mr. E. Oxley, Norton Siding.
3. Mr. G. H. Walker, Marandellas.
4. Mr. J. M. Thomson, Nyabira.

Analyses of the crops shew that Mr. Fletcher had 35.31 per cent. of bright leaf, 35.39 per cent. of medium and 1.32 per cent. of dark. Points were deducted for green, perished, loose or inferior leaf, and the winner had a remarkably good record in this respect.

Mr. Oxley had 49.73 per cent. of bright leaf and 18.93 per cent. of medium, but had more points deducted than did Mr. Fletcher.

Mr. Walker had 32.90 per cent. of bright leaf and 35.90 per cent. of medium, while Mr. Thomson's figures were: Brights, 38.53 per cent.; mediums, 32.40 per cent. Both these growers lost points for inferior leaf.

The following were the weights of the crops:—

Mr. T. Fletcher, 13,507 lbs.
Mr. E. Oxley, 5,745 lbs.
Mr. G. H. Walker, 27,685 lbs.
Mr. J. M. Thomson, 8.104 lbs.

The percentage figures of these crops are exceptionally good, and demonstrate the substantial progress that is being made in the tobacco growing industry of this country.

"**Native Cattle Dealers Licensing Ordinance, 1920.**"—This Ordinance, the purpose of which is to regulate the employment of natives as cattle dealers, was introduced at the last session of the Legislative Council, and, with one amendment, adopted. The Ordinance provides that any person desiring to employ a native for the buying of cattle from natives shall obtain a licence from the Native Commissioner of the district in which it is proposed to employ the native. The amendment to which we have referred renders it possible for a licence to be valid in another district, provided it is endorsed by the Native Commissioner of the latter district. The cost of the licence is £10, and the penalty for non-compliance with the terms of the Ordinance is a fine of £50, or in default, imprisonment for six months.

As stated during the debate in the Legislative Council, the substantial amount of the licence should have the effect of inducing cattle dealers to make careful enquiries into the antecedents of natives employed, and it is to be hoped that the evils coincident with the former unrestricted buying of cattle will be removed.

Live Stock Statistics.—Tables of figures shewing the numbers of live stock in this Territory at 31st December, 1919, and the amounts of animal produce for the year 1919, appear in this issue. These figures have been collected annually since 1914 and published in this *Journal.* The total number of cattle in Southern Rhodesia is given as 1,331,284, of which 678,508 are owned by Europeans. The total in 1914 was 748,058, of which 341,878 were European owned; for the first time since statistics have been available the cattle owned by natives are in the minority. The total of pure-bred cattle in the country is given as 6,610, Shorthorns topping the list with 1,727.

The numbers of small stock shew a decline, but poultry increased by 15 per cent. During 1919, 229 new dipping tanks were erected, and the total at the end of the year was 1,583.

Rainfall Returns.—Considerable delay is occurring in the rendering of rainfall returns, and in consequence the particulars published at the end of this *Journal* are usually incomplete. This is particularly to be regretted on the present occasion, for June completes the meteorological year, and we are unable to give the total rainfall at many stations.

We would again ask recorders to send their returns in promptly, not later than the 15th subsequent to the month to which the figures apply, and so enable publicity to be given to information which is of considerable interest and value.

Slaughter Cattle for the Union. Permission has now been granted by the Union authorities for the despatch of slaughter stock from this Territory to Randfontein, Transvaal. The cattle are placed in the quarantine section of the abattoirs upon arrival, and are subject to the same conditions in force at other approved abattoirs. This extension of the markets in the Union will provide a further outlet for our beef export trade, which is now assuming considerable proportions, and may be regarded as a good augury for the future.

The Salisbury Show.

We would draw attention to the two cups which are offered for competition in maize classes at the forthcoming Salisbury Show. The first cup is valued at 25 guineas, and is presented by the Bechuanaland Trading Association to the exhibitor obtaining the most points in any one breed according to the following scale :—

Cob Classes	1st	2nd	3rd	4th	5th
500	50 pts.	40	30	20	10
200	25	20	15	10	5
100	15	12	9	6	3
10	10	8	6	4	2
1	5	4	3	2	1
Class 421	25	20	15	10	5

A further cup, valued at 30 guineas, has been presented by Messrs. R. Murray & Co. as first prize for grand championship classes 422 to 424, best 500 ears. The cup has to be won three times, but not necessarily in succession. A second prize, consisting of half-a-ton of Safco fertiliser, has been presented by the Anglo-African Trading Co., Ltd.

Statistics of Live Stock and Animal Produce for the Year 1919.

By F. Eyles, F.L.S., F.S.S.

The tables of figures shewing numbers of live stock and amounts of animal produce for the year 1919 are presented in the usual form, and they may be easily compared with the statistics of previous years.

To facilitate such comparison, a table is here given shewing in parallel columns the totals of all kinds of live stock owned by Europeans at the 31st December, 1918 and 1919 respectively.

LIVE STOCK.

1918-1919.

	1918.	1919.	Plus Difference.	% Plus.	Minus Difference.	% Minus.
Cattle ...	600,447	678,508	78,061	13	...	...
Horses ...	1,599	1,967	368	23	...	...
Mules ...	1,988	1,864	...	...	124	6.2
Donkeys ...	8,868	8,402	...	...	466	5.2
Sheep ...	51,203	44,257	...	...	6,946	13.5
Goats ...	20,842	18,390	...	...	2,452	11.7
Pigs ...	15,248	14,585	...	...	663	4.3
Poultry ...	87,363	100,449	13,086	15	...	...

This reveals at a glance the fact that cattle, horses and poultry have advanced in numbers during the year, while mules, donkeys, sheep, goats and pigs have receded. The differences are shewn in parallel columns, expressed firstly as actual increases or decreases, and secondly as percentages shewing the rate of movement upward or downward in each case.

Two points in this table of gross totals call for comment here. At the end of 1918 it was found that every form of live stock, with the single exception of cattle, had decreased. We now find that the downward movement has been reversed in the case of horses and poultry.

The increase of horses may possibly be connected with the success of the inoculation against horse-sickness introduced by the Veterinary Bacteriologist, and, if so, the year 1919 will be marked as the beginning of a period wherein horses might be kept, and even bred, with safety in Rhodesia, and their numbers may then be expected to increase annually.

The increase of poultry may be regarded as the result of the spread of knowledge and interest in this branch of the industry following on the appointment of a Poultry Expert at about the beginning of the year under review.

The reasons why small stock generally are not receiving much attention in Rhodesia were suggested last year, and need not be repeated.

Cattle.—The total of cattle owned by natives at the end of 1919 is given by the Native Department as 652,776 head. Added to the total owned by Europeans, we get a grand total of 1,331,284 head of cattle for the whole country. This number is exactly 20,000 less than was anticipated, the total having been estimated as probably 1,351,000 head. The difference is due to an unexpected fall in the rate of increase of the native-owned herds. For the four previous years native cattle had steadily increased at an average rate of 10.7 per cent. annually. In 1919, for some unknown reason, the rate fell to 7 per cent., but it should be noted that figures for native-owned stock are less reliable than those for European herds, being based on estimates only.

The following table sets out the rate of increase of cattle during the last five years, and gives separately the rate of improvement of European-owned and native-owned herds, as well as the general position for the combined herds.

INCREASES OF CATTLE PER CENTUM.

	European, per cent.	Native, per cent.	All Cattle, per cent.
I. Gross increment, 31-12-14 to 31-12-19—5 years	98.4	60.7	77.9
II. Net rate of increase in 1918—1 year	12.6	10.6	11.7
III. Net rate of increase in 1919—1 year	13.0	7.0	9.97
IV. Annual rate of increase—net average over 5 years	14.6	10.0	12.2
V. Natural rate of increase in 1918—1 year	...	...	13.7
VI. Natural rate of increase in 1919—1 year	...	...	12.35

Several interesting and valuable points emerge from a study of this table. Line No. I. shews that the relatively well cared for herds owned by Europeans have practically doubled themselves in five years, while those owned by natives have increased by only about 60 per cent. Doubtless this difference would be less if it were possible to ascertain to what extent native herds have been depleted and European herds augmented by sales of native stock to Europeans. The third column on this same line shews that the gross total of all cattle (European and native) is more than three-quarters greater than it was five years ago.

Lines II. and III. shew that European herds increased somewhat more rapidly in 1919 than in 1918, but the rate of advance of native herds fell to 7 per cent. in 1919, the lowest on record. In spite of this, the increase for the whole country in 1919 was approximately 10 per cent (9.97 per cent.). Taken on this conservative basis, which has been checked by more detailed calculation, the herds of the country in five years' time will, if present conditions continue, exceed 2,000,000, while the export trade in cattle, subject to the same qualification, will be worth over £400,000. As stated, this figure is conservative, being based on the assumption that present conditions will continue. If we take into account the fact that the numbers of cattle in the country are increasing at a much greater rate than the consuming population, and that a certain proportion of cattle must be disposed of each year, it is quite within the range of possibility that our cattle export trade in five years will be nearer £800,000 than £400,000 in value.

The true rate of natural increase is higher than shewn on lines V. and VI., but cannot be ascertained because the number of cattle annually slaughtered for internal consumption is not available. A comparison of lines II. and III. with lines V. and VI. make it clear that the proportion of cattle at present being exported is about 2 per cent. of the gross total. The number of head imported is too small to affect this proportion materially.

An analysis of the composition of European-owned herds shews remarkable constancy from year to year, except in the case of untrained oxen, the proportion of which is steadily increasing as ranching progresses.

ANALYSIS OF COMPOSITION OF HERDS OWNED BY EUROPEANS.

	1917.	1918.	1919.
I. Proportion of females to all cattle	60.4 per cent.	60.1 per cent.	60.1 per cent.
II. Proportion of all bulls to total males	28.2 per cent.	26.2 per cent.	26.0 per cent.
III. Proportion of stud bulls to all bulls	11.0 per cent.	12.0 per cent.	12.1 per cent.
IV. Proportion of untrained oxen to all oxen ...	55.7 per cent.	60.8 per cent.	65.4 per cent.
V. Number of untrained oxen	84,000	107,454	130,833
VI. Number of trained oxen ...	66,956	69,170	69,158
VII. Acres of land cultivated	229,953	205,439	215,276 (estimated)
VIII. Acres cultivated per trained ox	3.44	2.9	3.1

Line No. VII. is added to the above table in order to exhibit the relationship between the area of land ploughed and the number of oxen trained to the yoke.

Any attempt to draw conclusions from the numbers of cattle in the different districts can serve no useful purpose, for it is evident that the large ranching companies shift their herds from district to district as occasion arises. The first column of main table No. I., if compared with the previous year, shews quite erratic fluctuations, doubtless due to this cause.

The diagram "Annual Increase of Cattle" illustrates the growth of the herds owned by Europeans and natives respectively, the former in 1919, for the first time, over-topping the latter.

Table No. II., analysis of pure-bred stock, must be taken as only an approximation to the true facts, and anything like close accuracy cannot be hoped for till breeders realise that under this head they should return *all* pure-bred stock, whether pedigree or not, but *no* grade stock, however good it may be.

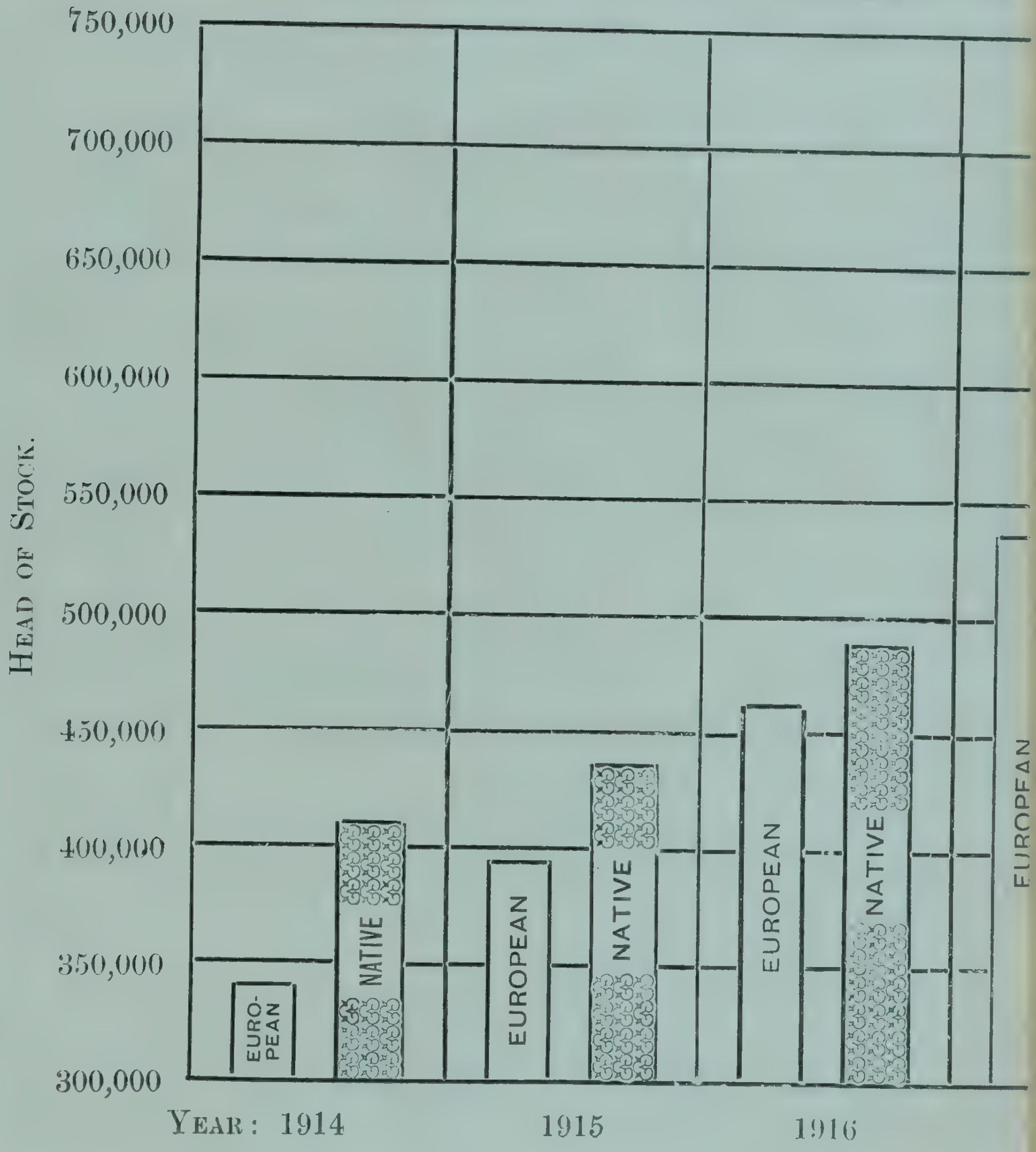
To illustrate the difficulty we have in getting precise details of pure-bred cattle, the returns for each breed for 1918, as originally received and published, are here given in the first column; for the same breeds, corrected figures, as the result of subsequent correspondence, in the second column; and in the third column, totals of pure-breds as now received for 1919. If progress in quality, as well as quantity, of Rhodesian live stock is to be recorded, it can only be done by the assistance of the breeders themselves, who should recognise the need of filling up the analysis of their pure-bred stock with great care each year.

PURE-BRED CATTLE TOTALS.

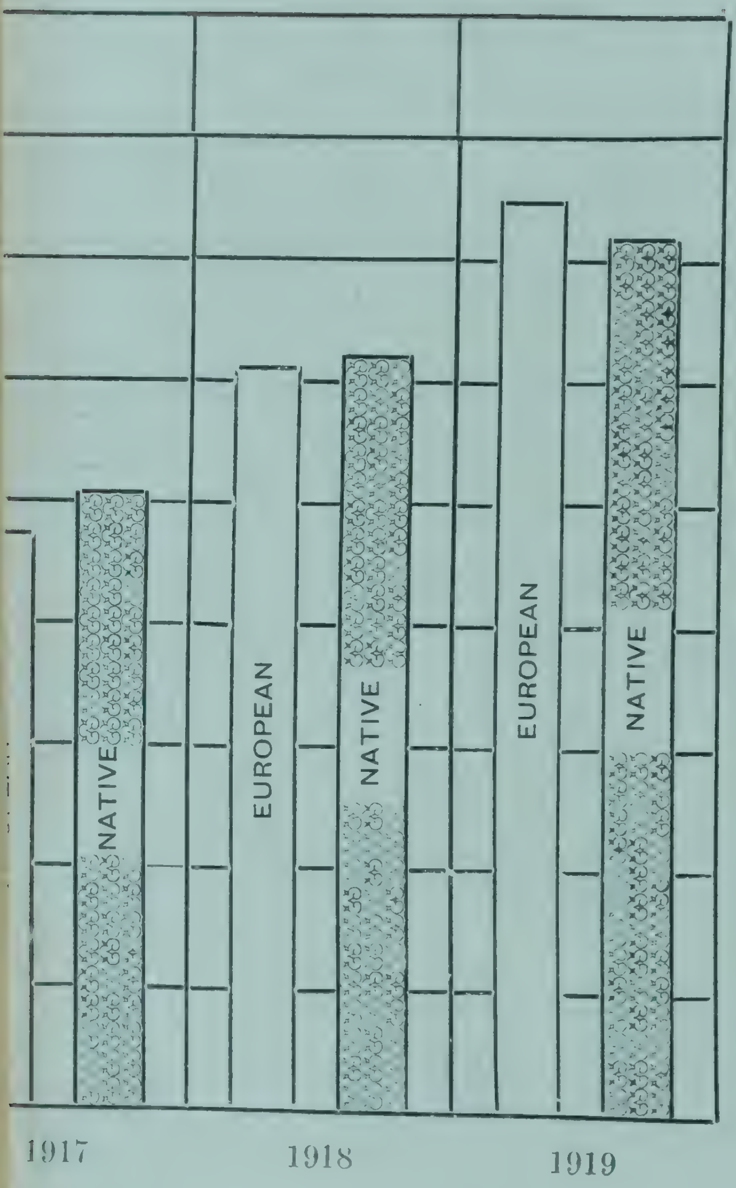
	1918 (as published).	1918 (corrected).	1919.
Shorthorn	1,817	1,617	1,727
Afrikander	1,278	1,278	1,535
Devon	937	843	823
Friesland	815	755	805
Hereford	733	661	776
Angus	477	457	408
Sussex	215	215	262
South Devon	95	95	164
Ayrshire	137	137	70
Red Poll	40	40	32
Jersey	7	7	4
Others	7	7	4
Total	6,558	6,112	6.610

Dipping Tanks.—During 1919 new tanks were constructed to the number of 229, and the total at the end of the year was 1,583. This

ANNUAL INCREASE OF



STOCK.



South Devon.		Ayrshire.		Red Poll.		Jersey.		Other Breeds.	
Bulls.	Females.	Bulls.	Females.	Bulls.	Females.	Bulls.	Females.	Bulls.	Females.
...	...	...	...	...	5	...	...	...	...
...	...	...	...	...	...	...	...	...	...
2	...	...	...	1	...	...	...	...	...
...	...	...	2	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...
1	...	...	...	1	...	...	...	...	...
10	10	...	...	..	...	...	...	...	...
21	51	1	...	1	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...
...	...	...	...	...	2	...	2	...	...
...	...	...	...	...	...	...	...	...	...
3	...	2	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	..	...	...	...
...	...	11	9	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	2	2
1	...	...	...	...	3	...	...	...	...
1	...	1	2	...	...	...	...	...	...
3	...	3	...	3	...	1	...	...	...
1	...	2	...	1	...	...	...	...	...
1	...	1	30	10	5	1	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	2	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...
9	34	4	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...
69	95	27	43	17	15	2	2	2	2
164		70		32		4		4	

Wool. lbs.	Wagons.		
	Ox.	Mule.	Donkey.
...	17	4	...
...	39	3	10
...	54	9	11
202	77	4	14
...	20	3	4
800	50	13	23
...	114	6	13
...	62	5	13
...	92	2	8
...	39	2	11
120	41	3	4
7,518	164	47	25
850	20	1	3
...	16	3	...
...	8	...	1
30	82	12	25
...	59	2	...
...	50	5	5
135	74	6	9
300	159	12	10
1,010	160	29	16
...	138	9	2
177	257	15	12
...	4	...	1
...	2	...	...
...	13	5	1
...	66	6	6
...	8	2	1
1,065	62	14	6
7,451	28	6	26
19,658	1,975	228	260

includes tanks on private farms, in native reserves, on mission stations, Government tanks and municipal tanks.

Small Stock.—With the exception of poultry, the numbers of all kinds of small stock and mules continue to decline. See table on page 297.

Poultry.—As regards the poultry industry, the downward movement of recent years has been arrested and reversed, the number of poultry of all kinds having increased in 1919 by 15 per cent., and the eggs sold by 16.6 per cent. The figures for poultry and eggs as at present available give no indication of the laying capacity of Rhodesian hens, because there is no record of the eggs used for home consumption, the return being called only for eggs actually sold. It may be mentioned here that the majority of farmers keeping poultry do not market eggs at all. The figures for 1919 are as follows:—

Total Stock of Poultry, 100,449 head; owned by 1,303 farmers.
Total Eggs Marketed, 136,407 dozen; sold by 682 farmers.

Animal Products.—These are presented in tabular form below for 1918 and 1919, the increases and decreases being shewn. Cheese was recorded for the first time. The small decrease in milk is more than counterbalanced by the large increases in cream and butter sold.

ANIMAL PRODUCTS.

	1918.	1919.	Plus per cent.	Minus per cent.
Eggs, dozen	116,950	136,407	16.6	...
Cream, lbs.	263,452	336,020	27.5	...
Milk, lbs.	3,240,931	2,908,392	...	10.26
Butter, lbs.	209,439	294,784	40.7	...
Cheese, lbs.	...	44,076	...	...
Wool, lbs.	24,157	19,658	...	18.6

The Shows.

VICTORIA.

The show held on the 19th and 20th of May marked a further advance in the progress of the Victoria district. Victoria is particularly happy in its show ground, which, if on the small side, is most prettily situated on the banks of the Umshagashi River and well shaded by fine gum trees. The existing produce sheds and cattle pens are well protected, but further tree planting is called for in order to allow for the expansion of exhibits which the next few years will certainly bring forth. It was unfortunate that the date of the show was somewhat too early to permit of any large exhibit of produce. The season has been an exceptionally late one, and but few of the maize crops in the eastern part of the district—the main agricultural area—were ripe. One cannot but think, however, that for the next few years and until two shows a year are warranted the cattle men would be wise to give way a little and fix a date for the show which will permit of larger entries in the produce classes.

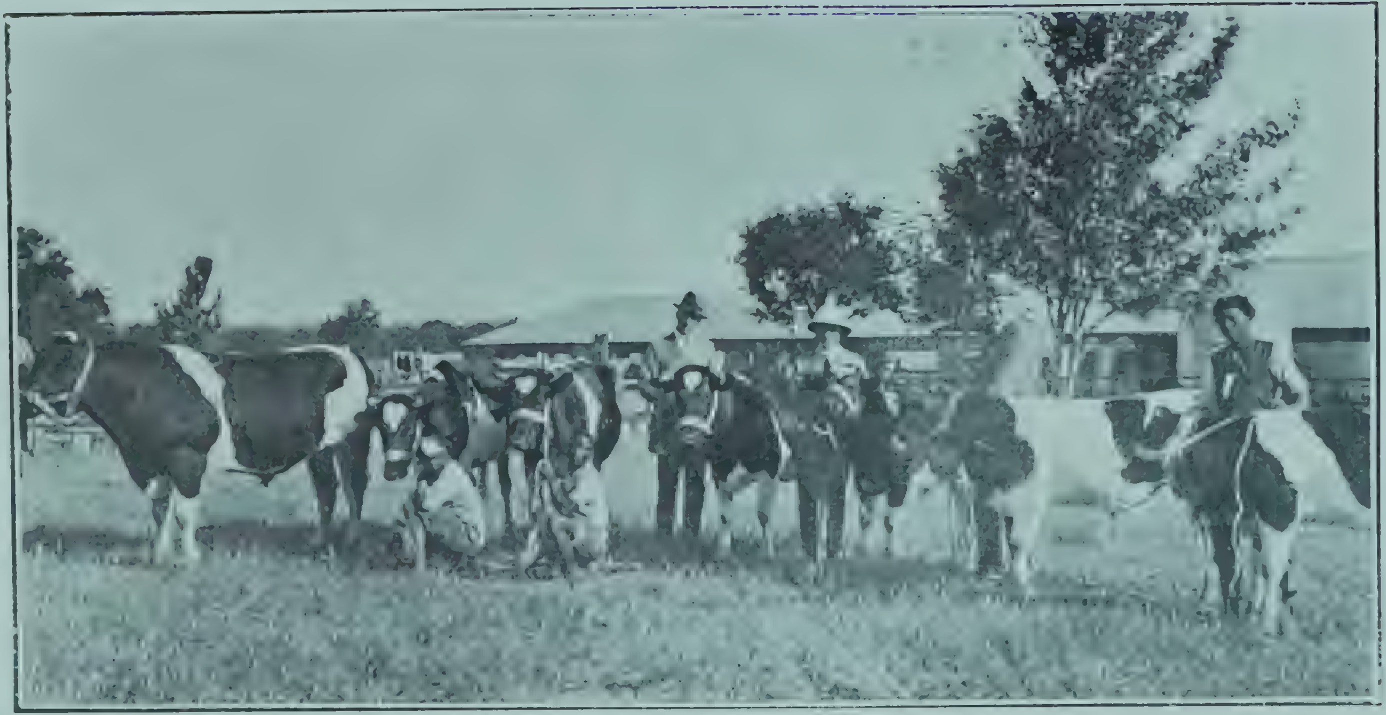
Throughout the show, which was opened by Brigadier General Sir Reg. Ford, quality was good, and only quantity was lacking. Grade cattle in the younger classes were particularly good, while the horse exhibits would do credit to any of the larger centres. A noticeable feature in these was the number of yearlings and foals bred in the district, and carrying the V.D. brand.

Cattle.—There was a good display of cattle, and it is evident that great strides are being made in the cattle industry in this district. The beef type of animal predominated, the chief exhibitors being Messrs. R. W. Evans, J. H. Williams, J. M. Fitzgerald, E. T. Kenny, J. Struthers and W. B. Richards. The award for the champion bull on the show went to Mr. J. M. Fitzgerald, whose young Hereford bull shewed marked quality, whilst Mr. J. Struthers gained the championship for the best bull bred in the district, and also for the best cow on the show. Mr. W. B. Richards' Shorthorn grade stock was a marked feature, the animals exhibited being of excellent quality and of strong constitution.

The exhibition of dairy cattle was rather disappointing, as this district is well adapted for dairying, and greater efforts should be made to supply the great demand for dairy stock. Mr. J. Struthers shewed some good Ayrshires, which were a strong class, as well as some very useful Devons. Lincoln Reds of good dairy type were exhibited by Mr. E. T. Kenny and Mrs. Cary of Victoria. Frieslands were not a strong class, and more might be done to encourage this fine dairy breed in the district. The chief winners were the property of Messrs. H. Bushney and C. Gloss.

Champion bull, Victoria Show, shewn by Mr. Fitzgerald.

Prize winning Devon bull, Victoria Show, shewn by Mr. J. Struthers.



Group of prize-winning Friesland cattle at Bulawayo Show. Owner, Mr. H. Clarke.

At future shows exhibitors should endeavour to get their cattle into better condition and accustom them to being led, as animals off the veld are both difficult to judge and lack that finish which is to be desired on a show.

Produce.—This section shewed a striking advance over that of former years, more especially in the quality of the material put on the show. The maize exhibits were fairly numerous considering the date of the show, and the Salisbury White cobs exhibited by Mr. Richards of Mara Ranch would do credit to Mazoe. A collection of farm produce shewn by Mr. J. R. Evans well deserved the special prize awarded by the judge. A special feature of this collection was the quantity of winter fodder products it contained. An exhibit of winter wheat (Early Gluyas) by Mrs. Cary was an excellent object lesson in the possibilities of this district for the production of winter cereals on moist vleis or under irrigation. The size and weight of the majorda and pumpkin exhibits were likewise very creditable.

BULAWAYO.

25th and 26th May.

This was the thirteenth show held under the auspices of the Bulawayo Agricultural Society, and the success which has attended past events was fully maintained on this occasion. The unfortunate appearance of African Coast Fever in the neighbourhood of Figtree of course affected the cattle exhibits, but the entries were only slightly less than last year. The show was opened by H.H. the Administrator and attracted a large number of visitors, not only from all parts of the Territory, but from the Union as well. The arrangements were characterised by that efficiency which is always associated with this show, and the Society is to be congratulated on the results of its efforts. The new sale ring is a very important improvement and permits of the exhibition of stock to the best advantage, at the same time ensuring comfort to buyers.

Reference was naturally made at the opening function to the lamented death of Mr. E. A. Hull, and a notable episode was the raising of funds by the auction of an eland bull for a memorial on his behalf. A sum of £780 was raised for this purpose in less than half an hour—a striking testimony to the popularity of this pioneer of the cattle industry in Rhodesia.

Cattle.—As usual beef breeds predominated, and there was a splendid representation of Shorthorns, Herefords, Lincoln Reds, Aberdeen Angus, Devon and South Devons, Sussex and Africanders. The principal exhibitors were: *Shorthorns*, Messrs. Forbes & Freeze, G. C. Woodforde and the B.S.A. Co.'s Shangani Estates; *Lincoln Reds*, Estate of the late E. A. Hull, J. Brebner; *Herefords*, C. S. Jobling, Sir Abe Bailey, B. R. Granger, George Mitchell; *South Devons*, S. M. L. O'Keefe; *Aberdeen Angus*, J. R. Stewart, Messrs. James & Worthington, Leo Robinson, E. A. White.

The Thousand Guinea Trophy produced exceedingly keen competition. and it is a matter for congratulation that the trophy still remains in the Territory. After a lengthy process of elimination the award eventually went to Messrs. Drummond Forbes & Freeze's Shorthorn bull "County Magistrate," a very handsome specimen of the breed, just over three years of age and extremely well brought up. There was a close contest for the reserve championship between Mr. Jobling's Rhodesian-bred Hereford bull "Devonby Dogma" and Mr. Leo Robinson's imported Aberdeen Angus "Vellox." "Devonby Dogma" is only eleven months old, and great things may be expected of him in the future.

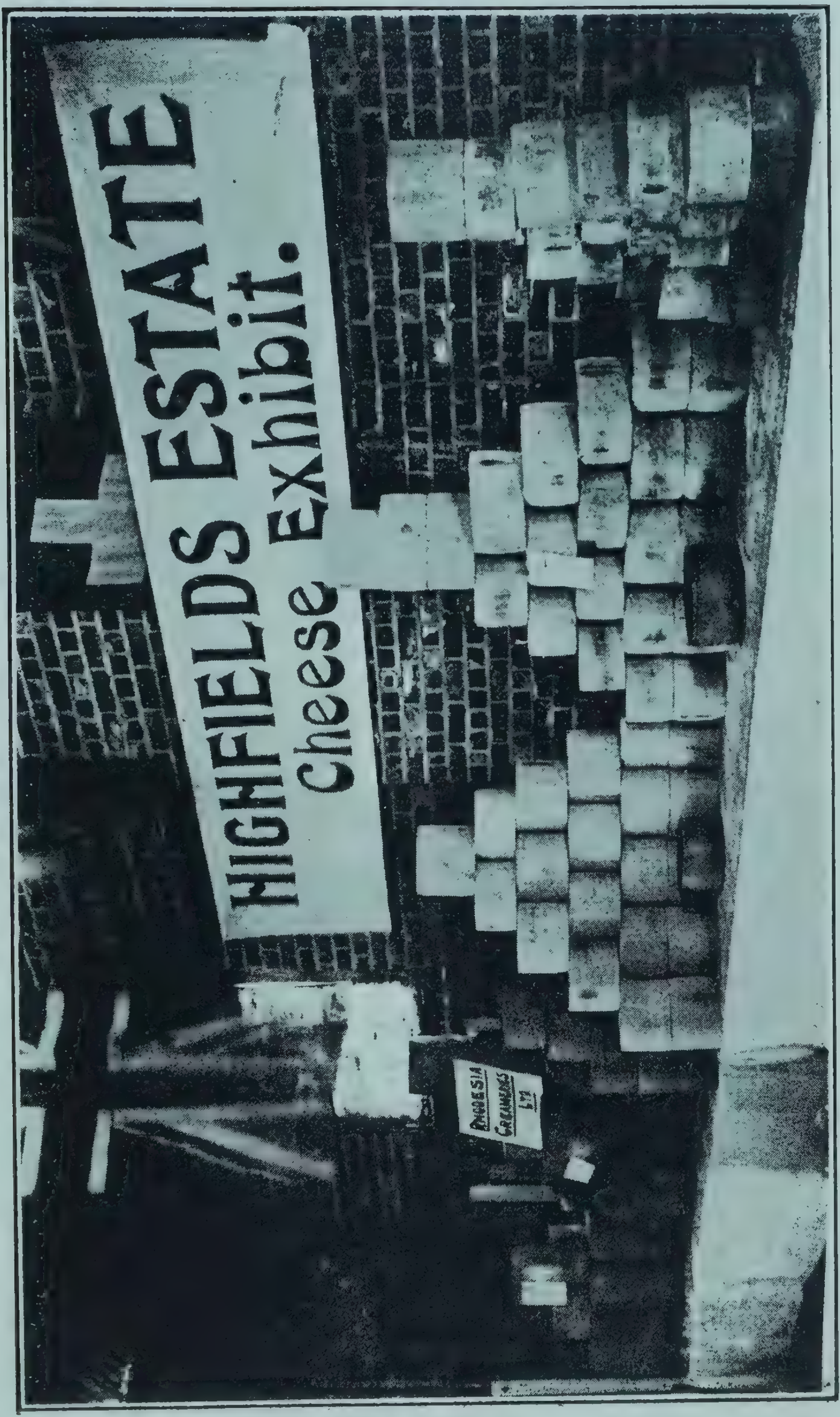
The steady progress of the dairying industry in Southern Rhodesia was clearly shewn by the good exhibit of both dairy cattle and dairy produce. The recognised dairy breeds, such as Lincoln Reds, Frieslands, Ayrshires and South Devons, were all strong classes, although the former breeds were better represented than the latter.

A feature of the show was the wonderfully good Lincoln Reds shewn by Mr. J. Brebner and the estate of the late Mr. E. A. Hull, who between them fairly swept the board. These cattle were chiefly conspicuous by their magnificent constitution and splendid dairy points. It would be difficult to match them anywhere in South Africa, and they reflected every credit on their owners for their ability to realise what is so often missed in South Africa, that sound constitution and early maturity can only be got by the careful feeding and management of the young stock. Frieslands were fairly well represented by Rhodesian owned cattle, as well as by a string of animals sent up by the Friesland Breeders' Association. Some of these animals were entered too late and did not compete in the show ring. The Friesland Breeders' Association are to be congratulated on their endeavour to increase the popularity of this breed in Rhodesia, and as Rhodesians begin to realise that dairying is a sound business proposition, there is no doubt that the demand for this essentially dairy type of cattle will be as great in Rhodesia as in the Union.

The two chief Rhodesian exhibitors among the prize-winners were Messrs. C. R. English and H. Clark. Mr. C. R. English won championship honours with "Herbert's Hope Rudolf," a three-year-old bull bred by Mr. H. Cloete. This bull shews milking qualities in the highest degree, being exceptionally good in the hindquarters, having a good top line and good depth of carcase. Mr. H. Clark, who won first prizes with the bull "Harlens Boy Johannes" and with the females "Sheltered Vale Snow Queen" and "Crowhurst Madam Butterfly," besides six other awards in competition with imported animals, is to be congratulated on his successes. Mr. John Wilson, the judge, remarked that he was pleased that the Friesland breed was making headway in Rhodesia, but it was a pity that some of the animals were not in better condition when brought into the show ring. This was certainly the case with some of the animals sent up by the Friesland Breeders' Association; but it must be borne in mind that they had travelled 2,000 miles by rail before being exhibited.

South Devons were represented by a small number of exhibits, but the quality was good. Mr. S. M. Lanigan O'Keefe was the chief winner with the champion bull "Trevelloe Romance" and the bull "Trevelloe

A group of bulls brought to Bulawayo Show by the Friesland Breeders' Association and sold locally.


HIGHFIELDS ESTATE
Cheese Exhibit.
RHODESIA CREAMERIES LTD

Marmion." The Trevelloe Estate got premier honours with the females "Trevelloe Teresina" and "Rose." Messrs. H. Thomas, W. G. Howard and F. P. Mennell were also successful exhibitors.

Dairy Produce.—The number of exhibits in the butter and cheese classes was disappointingly small, and the quality, with the exception of the first prize-winners, was not so good as might have been expected.

The chief fault in the fresh butter classes was the lack of development of flavour, rendering the butter rather insipid, whilst in one or two instances feed flavours were apparent. The fault in the flavour can be corrected by observing all the rules of clean milk production and seeing that the cream is properly ripened under good conditions before it is churned. In some instances the butter was mottled or streaky. This can be prevented by either brining the butter or by the use of a dry hair sieve when distributing the salt over the butter.

The salted butter class was hardly up to standard both as regards quality and quantity of exhibits. The test, however, is a severe one, and unless butter is especially well made and washed, it will not stand the ordeal of being kept under average conditions of temperature for any period of time. It is to be hoped that with the growth of creameries in Rhodesia a class for creamery exhibits will be included in future catalogues.

The cheese entries were neither numerous nor, with the exception of the first prize-winner, of outstanding quality. Greater attention should be paid to the production of clean milk, to the control of temperature in cheese-making, and lastly to the development of acidity throughout the period of its manufacture. Striking exhibits of Rhodesian cheeses were shewn by the Rhodesian Creameries, Ltd., and Highfields Estate. These two firms deserve every credit for their excellent displays. There was no exhibit of sweet milk cheese. This is a pity, as the sweet milk type of cheese is in great demand throughout South Africa. It has the merits of being easily made and of always commanding a higher price than Cheddar, and can be made without any expensive plant being required. As the cheese-making industry is developing rapidly, it is to be hoped that provision will be made in future shows for a prize for the best exhibition of 500 lbs. weight of both sweet milk (Gouda) and Cheddar varieties.

Poultry.—For number of entries, quality of birds, variety of breeds and organisation, this poultry show held the record. It was without doubt the finest show of poultry ever seen in Rhodesia, and was well up to the standard, in every way, of the biggest shows in the Union.

The judging commenced at 9 a.m. on the day before the opening of the show. The judges were Mr. R. F. Dott of Victoria for all heavy breeds, ducks and turkeys, and Mr. A. Little for all light breeds, table poultry, eggs, bantams, foods and appliances. The value of trophies, specials and prize money totalled £700, a sum greater, it is believed, than that offered at any other poultry show in the world.

There were several breeds hitherto not seen at any show in this country, among these being the Speckled Sussex, an excellent table bird and a good layer of large brown eggs—an ideal farmer's fowl. Black Orpingtons, White Rocks and Campines were breeds not hitherto seen at the Bulawayo show.

Entries in Rhode Island Reds, Utility Leghorns, Anconas, Black Leghorns and Indian Runner Ducks were very numerous, and nearly all of good quality. Minorcas, Brown Leghorns and Barred Rocks were fair in numbers and quality; the same applies to turkeys. White Wyandottes were good both in quality and numbers, and it was gratifying to see this improvement; it is an excellent breed, and eighteen months ago seemed to be on the wane. White Orpingtons, although not too well represented, were good in quality. The breeding pens were all good, but more entries in each class should have been staged. The children's classes produced some excellent birds, and the owners deserve all praise for their exhibits.

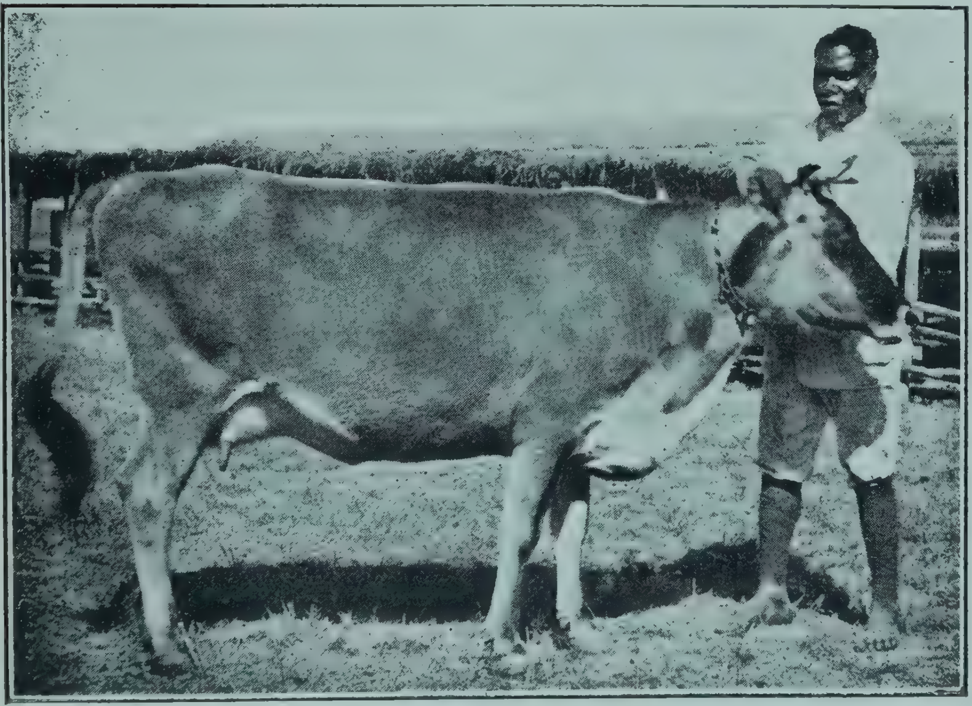
Several innovations were introduced at this show, viz., a group class for the best cock, cockerel, hen and pullet, the special prize for this being a silver trophy valued at 100 guineas; teams of six pullets (1) heavy breed, (2) light breed, the special prize for each being a silver trophy valued at 60 guineas; a class for the best collection of cold supper dishes made from poultry. The eggs were of very good quality, although there should have been more than 17 entries. A special prize of a silver cup, valued at £10 10s., was awarded to the best dozen.

Birds were entered from all over Rhodesia, although there was none from Salisbury or Gwelo; it is to be hoped that this omission will be remedied next year. A very fine lot of Black Orpingtons came from Stellenbosch, and several breeds from Vryburg. There is no doubt that still more entries would have been received from the Union, but unfortunately the dates chosen for the South African Championship Poultry Show clashed with those of Bulawayo.

The organisation, the staging of the birds and arrangement of the hall were excellent and all that could be desired, while the large number of visitors present the whole of the two days was an indication of the interest shewn. At the conclusion of the judging the judges examined candidates for the S.A. Judges Certificate, all passing well; the written examination was held previously. This is a move in the right direction, for more poultry judges are wanted in this country, and breeders, ladies included, should endeavour to sit for these examinations.

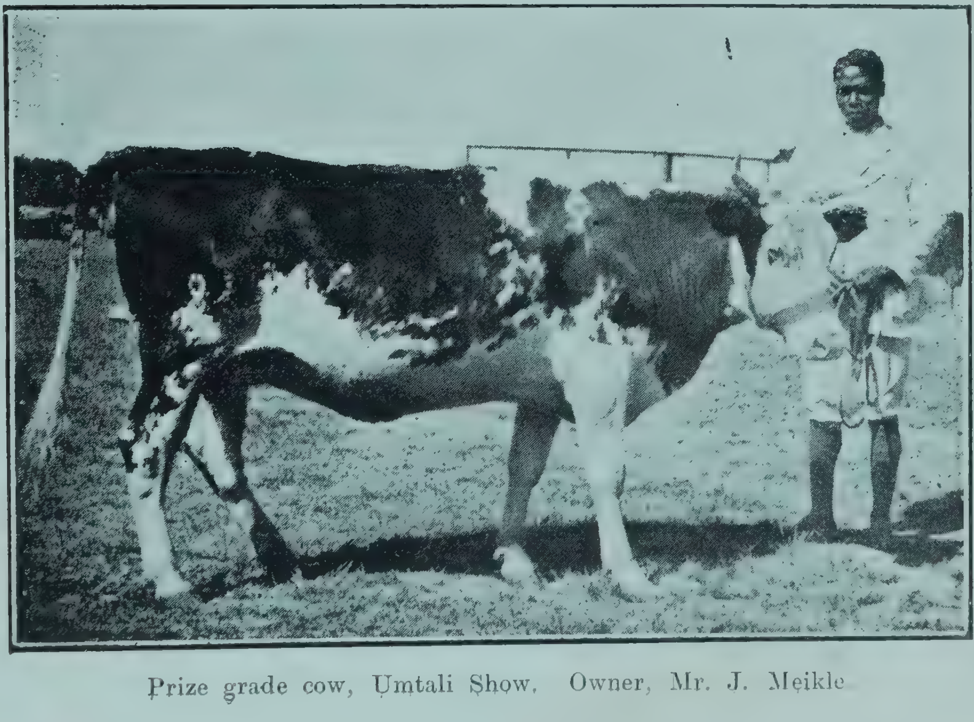
Fruit.—This section was better filled than has been the case in recent years, and the class of fruit exhibited shewed considerable improvement. The exhibition would, however, be greatly improved by having separate classes for the individual varieties of oranges, lemons and other fruits. At present all varieties of oranges are shewn in one class, under which system judging is difficult. The class for collection of fruit contained some excellent specimens. A fine exhibition of budded orange trees was put on by the B.S.A. Co.'s Sinoia Nurseries, who also displayed collections of some ten varieties of citrus fruit, both of which attracted considerable attention from visitors. Although Matabeleland is not up to the present largely interested in fruit growing, a more attractive schedule would be likely to attract outside growers to exhibit.

Mr. J. Brebner's champion Red Lincoln Bull, "Tealby Flower," Bulawayo Show, 1920.



Mr. J. Meikle's champion Jersey cow, Umtali Show.

Champion bull at Umtali Show, shewn by Farm Lands of Rhodesia.



Prize grade cow, Umtali Show. Owner, Mr. J. Meikle.

UMTALI.

The produce section at the Umtali show is increasing in importance each year. This was evident from the great advance in the quality of the exhibits shewn at the show held on the 25th and 26th June. It is much to be regretted therefore that the numbers also did not shew a corresponding advance. On the whole the maize exhibited at this year's show was perhaps better than that ever seen previously at Umtali, and it is interesting to note that some of the entries will compete at the forthcoming Salisbury and Johannesburg shows. Mr. T. D. Maclean, who is well known as a careful breeder and successful exhibitor of maize, is reaping the benefits of repeated efforts at selection and breeding in being able to shew very fine samples of the 12 and 14 row Salisbury White variety of maize, which, after winning at Umtali, will be forwarded to the forthcoming big maize shows. Mr. Norris also deserves mention in this section, the prizes being divided almost exclusively among these two competitors. In the general produce classes Mr. Strickland's exhibits were of a high standard of excellence as usual, and the aggregate prize for the highest number of successes was gained by him, while Mr. G. J. Franklin and Mr. Harrington did well in the classes in which they exhibited. Among the exhibits that deserve special mention was one of corn and cob meal from Mr. Strickland, shewing this article finely ground by means of a disintegrator, the resulting product being almost indistinguishable in appearance from maize meal. In this attractive form this article provides a cheap and wholesome foodstuff for cattle or pigs which would find a very ready sale in the market. Another foodstuff worthy of mention exhibited at this show was the peanut meal ground on the farm from the whole nut by Mr. Franklin.

An exhibit of various indigenous and exotic timbers grown locally and collected and shewn by Mr. Meikle attracted great attention. In view of the suitability of this part of the country for timber growing, it is safe to say that the enthusiasm shewn by the local farmers augurs well for what may become an important industry in Rhodesia. The Northern Rhodesia Fibre Company shewed a number of the finished articles manufactured from the local Hibiscus cannabinus fibre. Among other products which indicate the varied possibilities of the district may be mentioned the exhibits of wattle bark, coffee beans, sugar cane and cotton.

Of the fruit section this may without hesitation be called the best of its kind shewn in Rhodesia. Both in variety, number of species and quality, the Umtali show affords an exhibition second to none in Rhodesia. Given suitable opportunity, therefore, the Umtali show has many features in which it stands first in this Territory, and the committee will do well to emphasise these with a view to making it the premier show of Rhodesia in these respects.

Cattle.—Although the display of cattle was limited by an unfortunate outbreak of Coast Fever in the Penhalonga district, nevertheless some excellent animals were exhibited, and some very fine thoroughbreds were shewn in the Shorthorn, Hereford, Devon, Friesland and Angus classes.

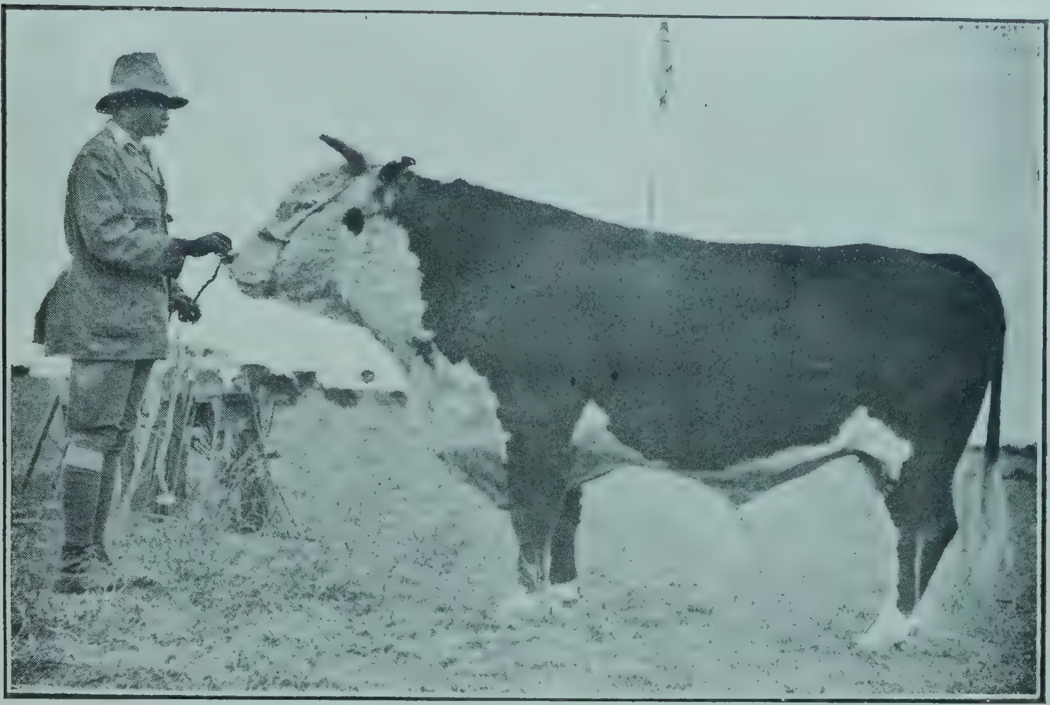
The fifty guinea cup for the champion bull was awarded to a fine Hereford shewn by the Farm Lands of Rhodesia. The Municipal cup for the best female was won by Mr. J. Meikle with a fine Jersey. The best beef bull prize went to the champion Hereford bull, the best dairy bull trophy going to Mr. G. J. Franklin's pedigree Friesland "Highveld Verwachting." Mr. E. Evans shewed a nice well-grown Aberdeen Angus bull, "Dornoch Elector," and was awarded premier honours in this class. The number of Devons exhibited was very small, but the Farm Lands of Rhodesia exhibited a useful animal of this breed. Grade cattle, although of good quality, were not numerous, the chief winners being Messrs. J. Meikle, G. J. Franklin, D. Barry, T. Wood and W. C. Bland.

Dairy Produce.—The exhibits of butter were as usual numerous and of high quality, there being no less than fourteen exhibits in the fresh butter class and ten in the class for butter stored one week. The winning exhibit, that displayed by Mrs. Strickland, was a very fine sample of butter, and gained 96 points out of a possible 100. St. Augustine's Mission was the second prize-winner with 93½, and Mr. G. M. Young was awarded the third prize. In the class for butter stored one week Mrs. Eickhoff gained the first prize with 92½ points, the second and third prizes going to Miss M. Harvey and Mr. G. M. Young respectively. In the fresh butter class some confusion exists as to what constitutes "fresh butter." The generally accepted ruling in South Africa is that fresh butter must be made from ripened cream, so that a true butter flavour is developed. If made from unripened cream butter is almost invariably marked down as being "flat" in flavour or "lardy" or "tallowy."

Some exhibits were handicapped by the fact that insufficient salt had been added. The practice of "brining" the butter is a good one, but the grain must be on the small side if the butter is to absorb sufficient salt to bring out the flavour. Weakness of body was a feature of some exhibits. This can generally be avoided by care in working and by not utilising the milk of newly calved cows for butter, as the butter fat in such milk is usually soft, and its use will result in a weak bodied butter being produced.

Poultry.—The number of poultry exhibits was greatly in advance of that of last year, and the quality a very distinct improvement. The organisation and the penning of the birds were in the hands of the Umtali Poultry Society, which has been recently formed, and promises to be very successful. Its members are to be congratulated on an excellent show of birds, all from Umtali and district. So satisfactory were the number of entries and their quality that the Agricultural Society are contemplating the building of a poultry hall for next year's show. This year it was held under canvas.

The exhibits numbered about 170, among which there were some excellent Speckled Sussex, Campines and Wyandottes. There was also a good show of Minorcas and Utility White Leghorns, but many of these should have received some attention before being penned, *e.g.*, legs and heads washed and the former free from scaly leg. The day is past when a bird can be taken straight out of its pen and placed on a show



Champion bull, Rusape Show, shewn by Farm Lands of Rhodesia.

Prize Friesland bull, Rusape Show, shewn by Mr. R. le S. Fischer.

condition counts for much; in fact, 15 points out of 100 are allotted to this in the case of White Leghorns.

The eggs were a feature of this section, and it was most gratifying to see such a number of entries, good and well graded; grading of colour, though, should receive more attention. All in the white section should be pure white; in the tinted anything from very pale pink or brown to fairly darkish brown, and brown anything to coffee colour, but all in each entry should be the same colour.

Umtali is going ahead rapidly as far as the poultry industry is concerned, and it is to be hoped that this advancement will be well maintained.

RUSAPE.

Rusape on the 1st July put up quite a creditable show, rivalling in fact the long established meeting at the neighbouring centre Umtali. The cattle mustered were representative of the district, including Shorthorns, Herefords, Friesland and Ayrshire and grades therefrom, together with a number of nondescript animals described according to the idiosyncrasies of the owners as beef or milk types.

Special mention must be made of the Hereford bull and Hereford cross-bred heifers exhibited by the Transau Estate, the former a lengthy, short-limbed, fleshy sire, the latter animals of extraordinary depth, width, substance and sweetness. A Friesland bull recently brought up from the south by Mr. R. le S. Fischer of Headlands also evoked admiration, combining in exceptional measure constitution with milking attributes, as also did the grade Frieslands of Wesermarsch type belonging to the same owner.

The final products of our cattle industry were exhibited by the Rhodesian Meat Packing Company in the form of canned corned beef in 12 ounce and 6 pound tins—our familiar "bully"—and tinned tongues, tallow and bone meal fertiliser.

The Rusape farmers are to be congratulated on their neat new cattle pens and produce sheds, cheaply constructed of timber and thatch. There was a representative gathering from all parts of the surrounding countryside, new settlers, particularly ex-service men, being conspicuous. On the second day a number of short addresses by members of the Department of Agriculture were given, and sports and races held, whilst the presence of the aeroplane "Rhodesia" added a novel feature to a most successful gathering.

The produce exhibited was on the whole disappointing, and ill represented the possibilities of the district as regards arable farming. Exhibits of maize were particularly weak, and it is understood that some of the budding maize growers reserved their exhibits in order to place them on the Salisbury show. Potatoes were good and beans moderate. An interesting exhibit was made by Mr. Tapson of green maize fodder grown on damp land without irrigation. Considering the lateness of the season, it was remarkable to find maize still green, and this indicates that more might be done in this way for the production of succulent feed for cattle and other stock.

A good display of dairy produce was shewn, the winners in the fresh butter class being: 1, Norman Tapson; 2, Mrs. Harnden; 3, Eric Pope, whilst in the salt butter class the first prize went to Norman Tapson, and the second to Mrs. Fitzpatrick. Mr. Pretorius and Mrs. Maclagan were placed first and second respectively in the cheese class, and Mr. E. Pope was given the award for cream cheese.

Poultry.—This section was excellent and shewed a great improvement on last year; the entries were far more numerous and the quality much better. Buff Orpingtons, Rhode Island Reds, Minorcas, Utility White Leghorns, Black Leghorns, ducks and turkeys were represented; of these the two first mentioned breeds were on the whole the best. One turkey tom was a very fine bird and fit to shew anywhere. Eggs were a feature. There were 22 entries of these, and all of good quality and well graded. More attention should be paid to condition. Even though the birds themselves are not washed, their legs and heads should be. To take a bird straight out of its pen and put it on a show without any preparation whatever is not doing it or its owner justice, and is not to the benefit of the industry. Rusape and the districts surrounding it are making rapid strides, and, with more care given to the birds, should ere long hold its own with the majority of districts in Rhodesia.

Report of the Chief Veterinary Surgeon

FOR THE YEAR 1919.

Presented to the Legislative Council, 1920.

African Coast Fever.—The number of fresh outbreaks during the year was eight and the mortality 798 head, as compared with five and 374 respectively during the previous year. Eleven farms regarded as infected at the beginning of the year were released from quarantine, no case of Coast Fever having occurred on any of them for at least 15 months.

Melsetter District.—From the attached schedule, which shews the distribution of the disease and the mortality, it will be seen that of the eight fresh outbreaks recorded five occurred in this district; of these.

three were on farms which had been previously infected but free for several years, and two on farms on which the disease had never been known to exist. From March, 1917, only one case of Coast Fever had occurred in the whole district, viz., on the farm Rookwood, in March, 1918. The appearance of the disease at five farms was therefore somewhat disconcerting. Fortunately infection was at a minimum, and the total mortality was six head, but it is possible that other cases occurred prior to the determination of infection.

Gwelo District.—On the 9th May it was reported that a number of cattle had died on the farm Clearwater, Hunter's Road Siding, and on inspection the existence of Coast Fever was diagnosed, and subsequently confirmed by microscopic examination. The degree of infection may be judged from the fact that up to the end of the month over 200 animals became infected, and in four months the total mortality was over 440 head. Obviously the disease had existed for a considerable period, and as there had been a considerable number of cattle movements in and from that locality, the main road to Gwelo running through Clearwater and Hunter's Road Station being the centre for cattle transport in that area, it was considered advisable to place a large area in quarantine. Fortunately there was no further spread of infection, and seven months after the discovery of the outbreak the area was considerably reduced. All cattle moved from the vicinity of the outbreak for six months previously were traced and placed in quarantine for a period sufficient to result in the manifestation of any infection carried by them. In one instance only was Coast Fever discovered.

Mazoe District.—On 6th May 62 oxen from the farm Clearwater, Gwelo district, were trucked at Hunter's Road Station, which is fortunately situated on this farm, and consigned to Wolf Hill Siding, Mazoe district, whence they were distributed to the adjoining farms Avonduur and Leopard's Vlei. On inspection on 14th May it was found that three had already died, and that of the balance 30 at least were visibly affected with Coast Fever, and the use of the thermometer shewed that not more than half-a-dozen were healthy. Under these circumstances, it was considered advisable to destroy all the animals involved, which course was immediately carried out. Six weeks later the farm cattle began to sicken and die, and a heavy mortality ensued.

Umtali District.—In December an outbreak occurred on the farm N'Odzi, one animal being affected. The herd actually involved consists of 46 well-bred South Devons, but there are over 700 head on the farm. Fortunately dipping has been regularly and properly practised for many years, and the ultimate result amongst the large number of cattle on the farm is awaited with interest. For several years there has been no known infection within fifty miles of this farm, and in regard to the farm itself District Veterinary Surgeon King remarks:—

> "The last case of Coast Fever on this farm occurred on 23rd May, 1914. During the intervening period of nearly six years cattle have been sent from it all over the district; indeed, the herd has been the principal source of stud bulls for farmers here. During the same period animals have also been exported to Portu-

> guese East Africa, where dipping is in its infancy and tick infestation the rule rather than the exception. It is difficult, therefore, to conceive the possibility of the disease having existed on the farm between 1914 and 1919."

Victoria District.—I am glad to be able to report that no fresh outbreaks occurred during the year. In regard to the position and course of events on the existing centres of infection District Veterinary Surgeon Hooper Sharpe states as follows:—

> "At the commencement of 1919 there was only one active centre of infection in the district, viz., Morgenstar, where there had been no cases of disease during the last two months of 1918, but in January a recrudescence occurred which was difficult to account for. Ticks had been exceptionally bad during December, 1918, and January and February, 1919, especially on veld which had not been burnt off during the previous dry season, and on to which the native herds had been moved as soon as the gardens were planted, and on these areas the infected ticks were left in May and June when the cattle were moved to the reaped lands. Fifteen deaths from Coast Fever occurred in January and two in February, since when no cases have occurred in the district."

Considering the very heavy infection which existed at Morgenstar to begin with, the officers concerned are to be congratulated on stamping the disease out in less than ten months, and more particularly in preventing the spread of infection to the adjoining and heavily stocked native reserves.

In July the areas of infection and guard areas were reduced, leaving only the Beza and Morgenstar infected areas with a suitable guard area, and in October the Beza area was released from quarantine.

The work of dealing with the disease in this district was most thoroughly organised and carried out by Mr. Hooper Sharpe, District Veterinary Surgeon, as will be seen from the following short résumé:—The first outbreak occurred in May, 1917, and the last in May, 1918. In all, twelve areas became infected, with a distance of over 40 miles between the two outside ones. At first there were not more than six dipping tanks in the whole district, but within twelve months practically every beast therein was being dipped.

Number of cattle originally involved	6,747
Mortality from Coast Fever	659
Mortality from other causes	2,175
Increase	2,096
On hand	6,009

The mortality from other causes includes a large number of animals slaughtered for consumption.

Dipping and Coast Fever. The heavy mortality resulting from the outbreaks in the Gwelo and Mazoe districts led to a good deal of criticism of dipping as a means of dealing with infected areas and as a means of preventing infection on areas where it has been consistently practised for a number of years. In the former case the total mortality from Coast Fever to the end of the year was 446 head out of a total original number of 658. Reference to the annexed mortality schedule will shew that 214 cases occurred in the first month, or to be more exact, within three weeks, as the disease was first suspected on the 10th May. It will be noted, further, that in the first four months the mortality was 437 head as against nine only during the succeeding four. The degree of infection to begin with was one of the heaviest we have ever had to deal with, and it is no exaggeration to say that but for dipping less than 10 per cent. would have survived three months.

In the Mazoe case we had the unparalleled experience of over 50 cattle actually suffering from Coast Fever being deposited (by rail fortunately) on three farms where tick infestation was at a minimum, as the result of regular dipping for a considerable period. The results were surprising and disappointing, inasmuch as up to the end of the year 266 head out of a total of 615 contracted the disease and died or were destroyed. The mortality was heaviest amongst the working oxen, and it has been suggested that this was due to the rapid elimination of arsenic from the skin as the result of the constant daily exertions. There is probably something in this view, but the heavy mortality generally was due to the fact that the imported infected cattle were heavily tick-infested on arrival, and were not dipped, so far as our information goes, until a week afterwards. In connection with this outbreak it has been alleged that our methods were at fault, in that dressing of the ears and tails of all animals was not carried out. In dealing with outbreaks in the past, tails and ears have been dressed where the cattle had not previously been subjected to regular dipping; in cases where dipping had been regularly practised these processes have not been insisted on, and there is nothing to shew that the subsequent mortality has consequently been increased. Our published records of the last ten years shew that the mortality from Coast Fever, and the period required to eradicate infection, whatever methods of dipping, hand-dressing, etc., may be practised, depends entirely on the degree of infection in existence to begin with. Where there has been a heavy mortality, and the consequent dissemination of large numbers of infected ticks, the subsequent mortality will be heavy, and will persist up to twelve months from date on which short interval dipping was begun. Where the disease is discovered early, say after one or two cases, and short interval dipping immediately adopted, the subsequent mortality will be negligible. Numerous instances could be stated in support of these views, but a comparison of the mortality at the Sawerombi, Clearwater and Northfield, and Avonduur and Leopard's Vlei centres for the year under review is sufficient.

Inspection under the "Cattle Cleansing Ordinance, 1918."—To provide for the better carrying out of the provisions of this Ordinance in areas where it is operative, Cattle Inspectors were relieved of the work of issuing cattle permits, and an increased transport allowance granted for the larger inspectorates, the object being to enable these officials to devote practically all their time to inspection of stock. On the whole the system works well, but one drawback soon became apparent, viz., when the Inspectors are urgently required at some particular farm or locality for enquiring into cases of suspected infective disease they are frequently away in another section and completely out of touch. It is impossible to avoid such occurrences, and we must rely on stock owners to take what steps appear necessary until the official arrives. The system has undoubtedly resulted in the more regular and proper dipping of cattle, but it is doubtful if it will assist to any extent in the earlier detection of Coast Fever and other destructive diseases. For this we must rely, and rightly so, on the stock owner to report anything and everything which in his opinion requires investigation. It has been suggested that stock owners should be compelled to report the death of every beast, whatever the cause. This proposal, however good in theory, would not in the opinion of the writer prove of any appreciable value in the earlier discovery of disease. A heavy mortality, whilst suspicious, is by no means an indication of the existence of an infective disease. Serious losses occur frequently from poverty and other causes where investigation is entirely unnecessary; on the other hand, an infective disease, Coast Fever for example, may exist for a considerable period with a mortality so slight that the officer dealing with the reports would have no reason to suspect the existence of anything dangerous. Of the total mortality amongst cattle in this country the writer estimates that not more than 6 per cent. is due to scheduled infective diseases, including quarter-evil. From this point of view alone it would seem unnecessary to burden stock owners with an obligation which would certainly prove irksome. After all, we must give stock owners credit for knowing their own business, and rely on them to report any suspicion of infective disease or when they have something to deal with which they do not understand. The solution of Coast Fever and various other difficulties rests largely with the stock owners and not on laws and regulations.. Where a stock owner cannot assign a definite cause for any illness or mortality, he could render real and sound assistance to the Department, with benefit to himself in many cases, by forwarding blood smears and a short description of the symptoms, or where death has occurred a description of the most prominent *post-mortem* appearances, with blood and spleen smears, for which purpose glass slides and wrappers for transmission, post free, are supplied.

Dipping Tanks.—During the year 229 dipping tanks were constructed, bringing the total as at 31st December up to 1,583. Considering the difficulty which existed during the greater part of the year in obtaining cement, and the scarcity of men skilled in tank construction, this increase is satisfactory, but many tanks are still required before the dipping of all cattle in the areas under the Ordinance can be carried out.

Quarter-Evil.—This disease continued to spread throughout the year, and appeared in the following districts in which its existence had not previously been recorded, viz., Salisbury, Lomagundi, Mazoe, Mrewa, Hartley, Marandellas and Charter. A solitary case was diagnosed in Melsetter district and confirmed microscopically. Upwards of 225,000 doses of vaccine of various kinds were distributed during the year. The results of inoculation on the whole, whilst not unsatisfactory, are by no means uniform, and it cannot be said that any one preparation is superior to the others. In Matabeleland the mortality recorded was 933 head of cattle, and in Victoria district 145 head. Statistics from other affected districts are not available.

The Assistant Chief Veterinary Surgeon observes in regard to the incidence of quarter-evil in Matabeleland that the mortality during the year in which it first makes its appearance in a district is much heavier than in subsequent years, and goes on to make the following interesting remarks:—

> "When this disease broke out in Rhodesia at the end of 1916 and during its course it presented characters somewhat different from those in other countries in connection with it; they are perhaps worth recording.
>
> "1. The disease presented the appearance more of a contagious than a sporadic disease by the manner in which it entered the country at its south-west border and steadily spread in a north-easterly direction. At the present time the disease is assuming more of the sporadic nature usually attributed to it.
>
> "2. Another unusual character of it was that mature and even old animals succumbed to it in a small percentage of cases. This has been observed each year the disease has been in the country, but mature animals die only as a rule on the first visitation of the disease to a herd.
>
> "3. A third peculiarity was that animals died from the disease all the year round. On referring to my reports it will be seen that outbreaks occurred at Plumtree during every month of 1917, and that when the disease started at Belingwe in March, 1918, outbreaks occurred there every month until and including April, 1919. Despite this fact, clinical experience of the disease tends to suggest that the disease in the first infected districts is becoming seasonal, the same as it is in other countries. Our records, of course, have not extended over a sufficient length of time to be reliable, but such as they are they appear to confirm the idea that the disease occurs to the greatest extent after the rains have fallen, that is, in December and January after the first portion of the rainy season, and in June, July, August and September after the second and heavier portion of our rainfall."

Anaplasmosis and Piroplasmosis in Cattle.—These diseases, colloquially termed gall-sickness and redwater respectively, caused a considerable mortality, chiefly amongst pure-bred and grade animals. Statistics are not available, but generally it may be said that both diseases were more prevalent than during the previous year. In regard to the incidence of these diseases there is nothing to add to the remarks contained in my last annual report, which may be summarised as follows:—An increase in the prevalence of and the mortality from gall-sickness and redwater is to be attributed to (1) increased tick activity, the result of ineffective dipping, and (2) the relatively greater susceptibility of pure and grade stock and an exaltation of the virulence, particularly of gall-sickness, by passage through them.

Anthrax.—Four outbreaks occurred during the year, the most serious being in the Shamva section of the Mazoe district, where 102 head of cattle died on eighteen farms. One cow died on a farm in Hartley district, and two oxen on the Macheke-Mtoko road. All the cattle involved in these outbreaks were vaccinated, with most satisfactory results. In the Shamva section the mortality ceased very shortly after treatment. At the Native Commissioner's station, Mtoko, a small vlei known to be grossly infected was fenced, with the object of preventing the access of any animals thereto

Contagious Abortion in Cattle.—The history of contagious abortion in cattle in Rhodesia was fully discussed in an article by the Government Veterinary Bacteriologist which appeared in the *Journal of Comparative Pathology and Therapeutics* for June, 1915, and reprinted in the *Rhodesia Agricultural Journal* for April, 1919. Since the original publication of this article observations have shewn that this disease is wide-spread throughout the Territory, and in most cases its specific nature was not suspected by stock owners, either European or native. There is one instance of a native regarding it as dangerous, because his method of dealing with aborters was to sell them to the first buyer that came along. The measures carried out in dealing with an infected herd, viz., the destruction of all aborted fetuses, a course of inoculation with massive doses of a devitalised vaccine prepared at the Veterinary Laboratory, dipping, the removal of bulls from the herd for a period of from four to six months, and where possible the segregation of known aborters, appear to have given satisfactory results, judging from the fact that in many instances the calf crop during the following season was practically normal. It is not claimed that these or any other measures will eradicate infection or prevent its spread, but any procedure which results in an early return to normal calving in an infected herd must be regarded as a distinct advance in the treatment of this disease.

Tuberculosis.—The only case recorded in the Territory during the year was that of an aged Sussex bull originally imported from England. At the Johannesburg municipal abattoirs eight cases were detected on *post-mortem* inspection of Rhodesian slaughter cattle.

Trypanosomiasis.—A number of fatal cases occurred amongst cattle in the Melsetter, Hartley and Wankie districts. Unfortunately reliable statistics are not available.

Myiasis in Cattle.—Myiasis is a condition produced through infestation with the larvæ or maggots of certain flies; the term screw-worm is commonly used from the fancied resemblance of the larvæ to a screw, and because of their propensity for boring into the surrounding tissues. This condition was first observed in the Salisbury and Mazoe districts in 1918, since when it has been recorded in practically every district in the Territory. It is most prevalent during the summer months and in districts with a heavy rainfall, but cases are not unfrequently seen during the winter. The destruction of the maggots is a comparatively simple matter, provided the animal is thrown and the wound or cavity thoroughly dressed. Volatile agents which penetrate thoroughly into all the burrowings of the maggots are best, and of these carbon bi-sulphide has given the most satisfactory results. To prevent further infestation, the wounds and surrounding skin should be dressed with an emulsion of Stockholm tar containing a small quantity of iodoform in solution, and finally the application of dry wood ashes or lime. To reduce the fly crop as much as possible every maggot should be destroyed and all carcases buried deeply or burned.

Export of Cattle.—The export of slaughter cattle to Union markets was continued throughout the year. In August the Union Government authorised the exportation of breeding cattle to the Northern Transvaal for re-stocking purposes. To Portuguese East Africa a small but steady supply of slaughter cattle was maintained; also of breeding cattle and working oxen. With the exception of a small number of cases of tuberculosis discovered on *post-mortem* inspection at the Johannesburg abattoirs, it is satisfactory to be able to record that no case of infective disease was found amongst any cattle exported. A schedule is attached shewing the number of cattle and other stock exported during the year.

To facilitate the export of cattle by road from Victoria and the adjoining districts to the Union, a stock route was laid out from Victoria to Liebig's Drift on the Crocodile River, and a Cattle Inspector appointed to the drift for the proper control of all stock exports.

Horse-Sickness.—The total number of deaths reported during the year was 89, mostly horses. This, however, does not represent the total mortality, as many cases are not reported to the Department. The Government Veterinary Bacteriologist continued his investigations, and during the year inoculated a large number of horses with most satisfactory results. The subject is fully dealt with in his annual report.

Glanders.—No case of glanders occurred, and no re-actions to the mallein test, which was applied to all imported horses, mules and donkeys.

Epizootic Lymphangitis.—An outbreak of epizootic lymphangitis or African farcy occurred amongst the mules at the Citrus Estate, Mazoe, during the month of January. The diseased animals, five in number, were destroyed, and every precaution taken to prevent the further spread of infection, and so far no cases have been detected. It is impossible to explain the re-appearance of this disease after over ten years' freedom from it. None of the diseased animals had been imported during recent years, but that in which the disease first appeared is known to have been involved in an outbreak in Bulawayo in 1907.

Importation and Exportation of Stock.—As all importations and exportations are dealt with by this Department, a schedule is attached shewing the numbers dealt with.

AFRICAN COAST FEVER.—INFECTED AREAS AND MORTALITY, 1919.

District.	Farm.	Original No. of Cattle.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
MELSETTER ...	*Fresh Outbreaks—*														
	Nooitgedacht ...	61	...	1	...	...	...	...	...	...	...	...	...	...	1
	Morgensen ...	211	...	2	...	...	...	...	...	...	...	...	...	...	2
	Grasslands ...	67	...	1	...	...	...	...	...	...	...	...	...	...	1
	Mermaids' Grotto	239	...	...	1	...	...	...	...	...	...	...	...	...	1
	Sawerombi ...	637	...	...	...	...	1	...	...	...	...	...	...	...	1
GWELO ...	Clearwater ...	658	...	...	...	...	214	81	91	51	1	3	...	5	446
	Northfield ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
MAZOE ...	Avonduur ...	615	...	...	...	...	62	...	85	62	61	28	24	6	328
	Leopards' Vlei ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
UMTALI ...	N'Odzi ...	46	...	...	...	...	...	...	...	...	...	...	...	1	1
VICTORIA ...	*Existing Outbreaks—*														
—	Morgenstar ...	1,975	15	2	...	...	...	...	...	...	...	...	...	...	17
															798

EXPORTATION OF STOCK.

	Slaughter Cattle.	Breeding Cattle.	Oxen.	Sheep and Goats.	Horses.	Mules.	Donkeys.	Pigs.
Union of South Africa, *via* Plumtree ...	14,781	3,794	...	223	22	30	46	140
Union of South Africa, *via* Liebig's Drift ...	7,464							
Belgian Congo	...	8	...	1,255	1	11	...	155
Northern Rhodesia	...	...	...	940	22	21	70	67
Portuguese East Africa	1,006	567	115	146	10	5	5	46
	23,251	4,369	115	2,564	55	67	121	408

IMPORTATION OF STOCK.

	Bulls.	Heifers.	Sheep and Goats.	Horses.	Mules.	Donkeys.	Pigs.
From the United Kingdom	55	63	...	...	...	...	...
From the Union of South Africa	590	246	25,690	916	332	339	17
	645	309	25,690	916	332	339	17

The Cultivation of Rice

(Continued.)

By H. G. Mundy, F.L.S., etc., Government Agriculturist and Botanist.

Producing Areas of the World.—Cultivated rice (*Oryza sativa*) forms the staple food of probably not less than one-third of the entire human race, and possesses the advantage that it can frequently be grown on land too ill drained and swampy to produce any other crop. The chief rice growing countries of the world are India, China, Burma, Japan, the Southern States of the U.S.A., Egypt, Java, the Philippines, Italy, Spain and Brazil.

Varieties.—The many so-called varieties of rice are too numerous to refer to in detail, but broadly speaking there are two main types, namely swamp or aquatic rice and upland or hill rice. These main types may again be sub-divided, according to the colour of the husked grain, into white rices or red or pink rices. The great bulk of the rice produced throughout the world is of the swamp variety, and is grown either on lands subject to natural inundation or under artificial irrigation. Upland rice is, however, grown to quite a considerable extent in China, India and the Malay States, usually at higher altitudes and under very much dryer conditions than is swamp rice. It will thus be seen that the type of rice at present grown by the natives of this Territory falls under the latter category.

Rice in British India.—The bulk of Indian rice or paddy is grown under swamp conditions or under irrigation, and in 1905-6 the total area devoted to this crop in British India was estimated at 73,400.522 acres. Methods of cultivation vary too greatly to describe in detail, but generally it may be said that the seed is either sown broadcast just prior to the monsoon or is sown in seed beds and the young plants transplanted when about a fortnight to three weeks old. Moderately stiff soils such as clays or clay loams are preferred for the crop, but when temperature and rainfall or artificial irrigation conditions are suitable, it is successfully grown on much lighter and sandier soils. To facilitate irrigation or to catch and retain the natural rainfall, the land is terraced and laid out in beds just as is frequently done in South Africa for irrigated lucerne, though to retain more water the banks are usually made higher. Broadcasting is the more common method of sowing in naturally swampy land, but where terracing and irrigation is practised the seed is usually sown in a nursery and the young plants thence transplanted. Occasionally on unterraced land drilling is adopted in place of broadcasting. The usual rate of seeding either when broadcasted or drilled is about 100 to 120 lbs. paddy (unhusked) rice per acre. When the transplanting method is followed, the rate of seeding is smaller and varies from about 30 lbs. to 90 lbs. per acre.

In India a good yield from transplanted rice is from 2,500 to 3,000 lbs. per acre, while broadcasted or drilled seed should yield up to 2,000 lbs. per acre. Preparatory cultivation is carried out somewhat as follows. When transplanting is practised the seed bed is thoroughly ploughed either dry or inundated. If the former, it is inundated before sowing. In either case at sowing time the mud is smoothed down and the seed sown thickly in the mud. Water is led on three or four times during the first ten days, but only sufficient to temporarily saturate the soil. After about a fortnight the beds are completely inundated and kept so until towards the end of a month the seedlings are ready for transplanting. Three or four seedlings are transplanted together in a bunch at intervals of about 6 to 8 inches each way. The land into which the seedlings are transplanted is prepared and treated similarly to the seed beds, and once the crop is in, is usually kept inundated until the grain is nearly ripe, when the water is led off and the crop matured. It is sometimes found desirable to drain the land two or three times during the growing season to permit of weeding.

Rice in the United States of America. -The bulk of the American rice crop is grown in the States of Louisiana, Texas, Kansas and California. The first commercial rice crop in California was grown in the year 1912. By 1914, 16,000 acres were devoted to the crop, and three years later the State statistics shewed 67,000 acres of rice under irrigation. The climatic conditions in the Californian rice belt are mostly those of a semi-arid zone with hot summers, mild winters and a mostly winter rainfall of 10 to 20 inches. During July and August the temperature rises as high as 105° to 115° F. Irrigation is practised. The soils are mostly clays, clay loams or silt loams underlain by an impervious sub-soil which holds up the moisture.

As in India, the rice fields are mostly terraced or contoured with low banks to retain natural inundation waters or to render artificial flooding more easy.

Methods of Sowing.—Swamp rice which is to be transplanted is sown in beds and watered daily until about 6 to 8 inches high, when it is ready for transplanting, and a spade is run under the plants to cut the roots and facilitate lifting. The rice field is worked into a thick mud 4 to 6 inches deep with about 1 inch of water over the surface, and into this mud the young plants are set, in rows 8 by 6 inches apart. The land is kept flooded until the rice is 12 to 15 inches high, when the water is run off and the crop weeded. It is then re-flooded and kept so until about ten days before the crop is mature, when the soil is permitted to dry out to hasten even ripening and facilitate harvesting. During the inundated periods 6 to 8 inches of water is maintained over the entire fields. The final draining of the land is regarded as of special importance, since if neglected the crop ripens unevenly and much loss of grain results.

About 90 lbs. of seed rice is usually sown per acre, and a crop sown in April matures about September.

Harvesting. The crop is reaped promptly when the ears are ripe, otherwise much grain is shed. The heat of the sun also tends to crack ripe grain, and its quality is thus impaired. Ordinary harvesting machinery is used as for other cereals. Cutting commences when the heads begin to turn down and before the grain at the base of the panicle is quite hard. The crop is then tied in bundles and placed in shocks as for wheat or oats, but here again the ears are protected from the sun, and this is done by splitting a bundle and turning it head down over the cap of the shock. The shocks are left in the field for two to three weeks if the weather is dry, and are then ready for carting and threshing. Threshing on or near the lands is desirable, as this saves loss of grain. Yields vary from 2,000 to 3,500 lbs. unhusked rice per acre.

Conclusions.—From the foregoing brief descriptions of the conditions under which rice is grown in other parts of the world it will be seen that we have much soil in Rhodesia of a very similar nature. Our granite vleis are comparable to the silt loams of California or the sandy loams of India. The impervious sub-soil is provided by the decomposed granite underlying the vleis, and which as we already know holds up the water most effectively. Our summer temperature is not so high, but the growing season is longer, and the crop will ripen after the rainy season is over. Irrigation will not usually be practicable, but much can be done to retain the rainfall and drainage waters by the throwing up of banks or dams across the vleis, by terracing and by levelling. This method will merely be an extension of the native "pit" system. On the other hand certain soils are already so retentive of moisture that rice may be sown on them with the ordinary methods of flat cultivation, though some provision should be made to enable the land to be drained as the crop approaches maturity. In all cases the importance of this draining should not be lost sight of, since it appears one of the methods of overcoming uneven ripening. It is probable that the more common method of sowing will be broadcasting or drilling, but when labour is available the work entailed in transplanting should be no greater than in the case of tobacco, and the two crops might, it would appear, be worked with the same labour supply.

A contributory cause of uneven ripening of the native varieties, apart from inherent characteristics, may be the thin rate at which the seed is normally sown (see previous article). As has been seen, in other countries the rate is somewhere about 100 lbs. per acre, and though all our cereals are sown more thinly here than elsewhere, it would be advisable to test the effect of a heavier seeding of rice than that in vogue among the natives.

Local Markets.—The total consumption of rice in South Africa is very considerable, and present requirements are met almost entirely by importation from India and Burma. During the last three years Southern Rhodesia alone has imported on an average a million and a quarter pounds of rice, valued at over £10,000, annually. In the past

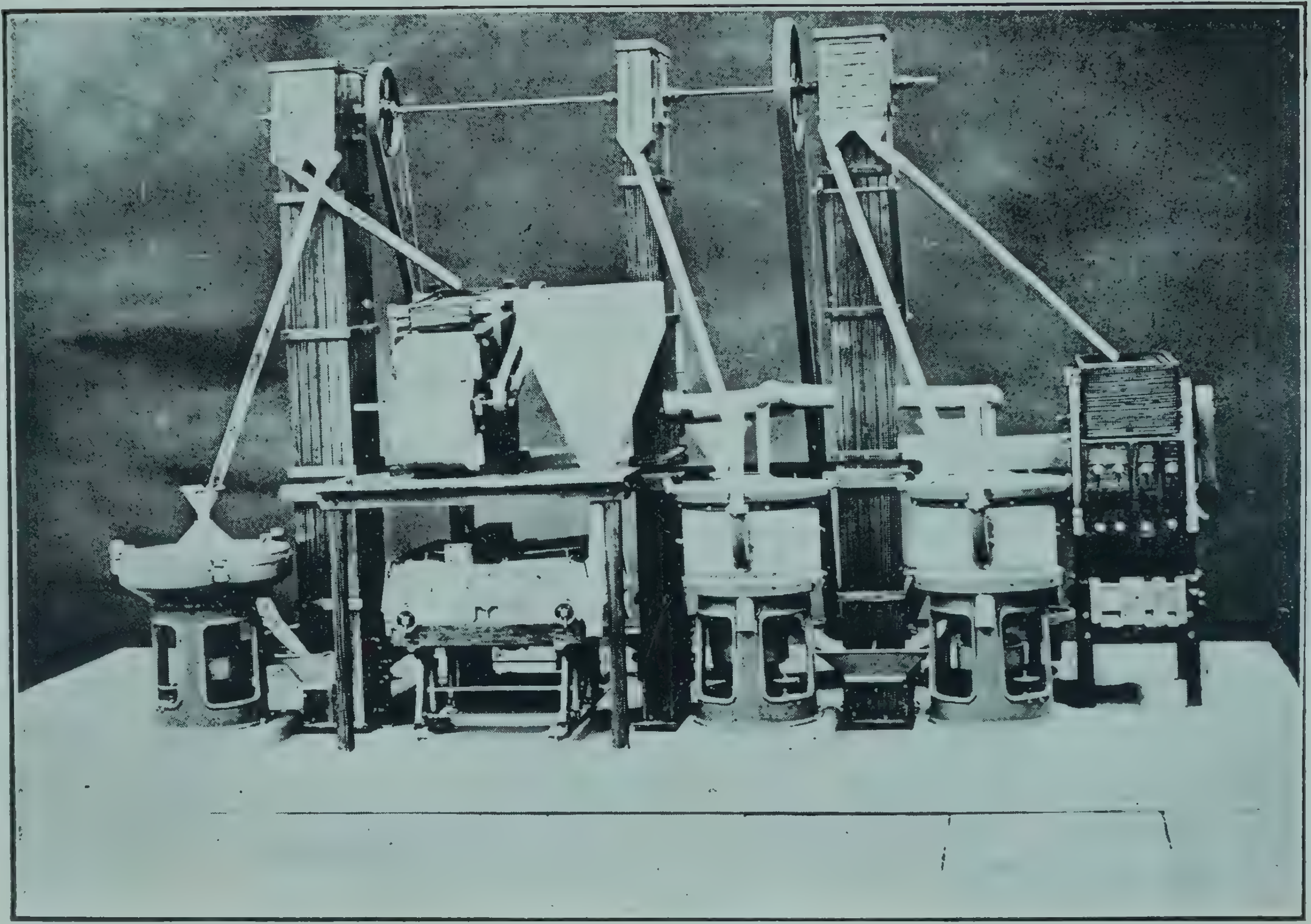


Fig. I.

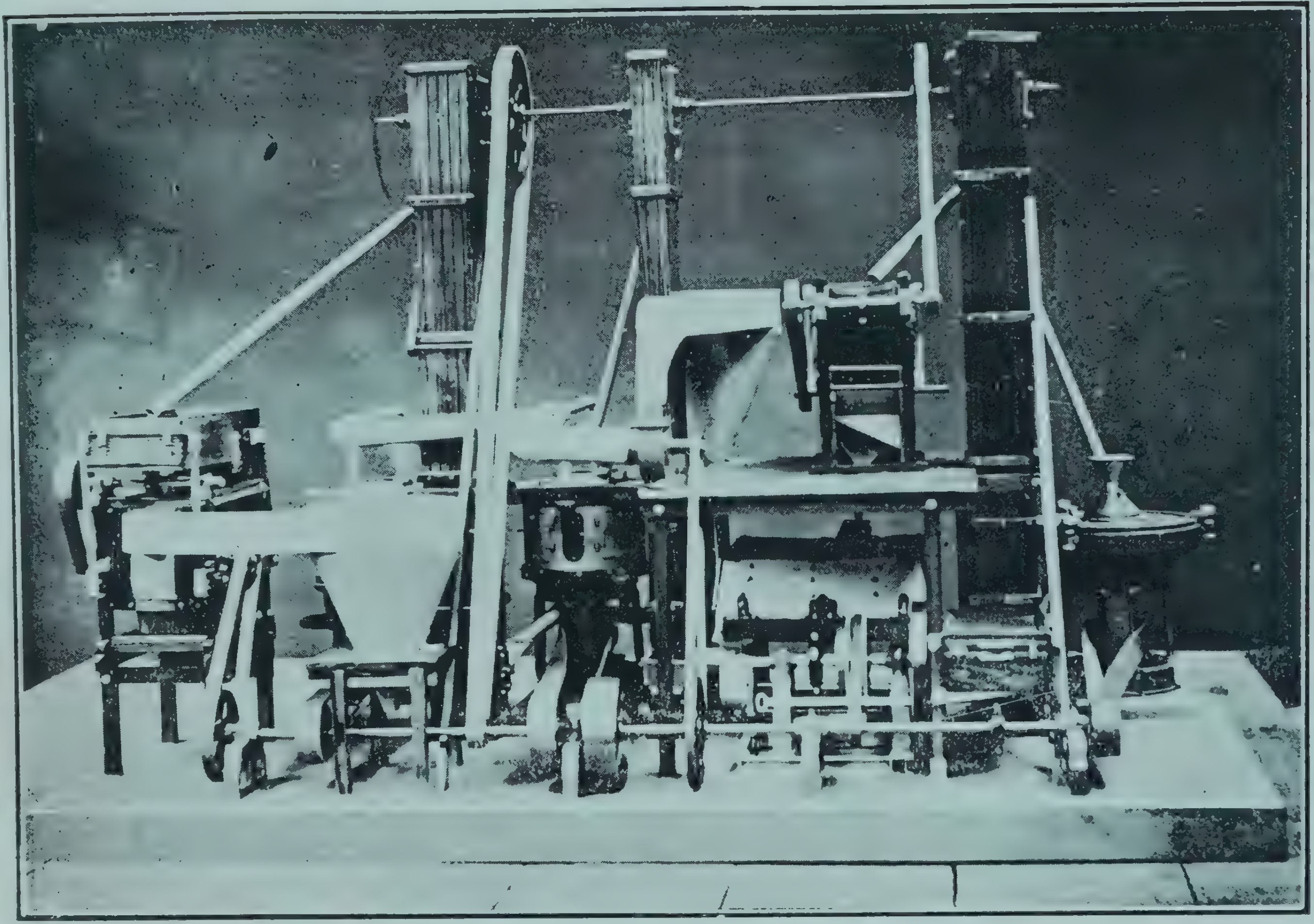


Fig. II. A complete small rice mill installation.

lack of machinery for preparing the paddy rice for market has discouraged all efforts towards growing rice in Rhodesia except as a native crop, but this difficulty has now been overcome by the establishment in Messrs. Mark Harris & Co.'s Mills, Salisbury, of a complete rice dressing plant, and this firm is likely to require all the rice that can be grown in the country for some seasons to come.

Seed Supplies.—The Department of Agriculture expects to have by the end of August supplies of seed of several imported varieties of rice, both upland and swamp, available for distribution under the usual terms of co-operative experiments. These supplies will further be augmented by issues of seed which Messrs. Mark Harris & Co. are prepared to make to intending growers. Native varieties should also be tested, as these may prove equally good yielders when improved by selection and grown under better methods of cultivation, while the imported varieties will probably require a season or two before they become acclimatised. In this connection it must be remembered that it is the unhusked rice or paddy which is used for seed.

Cultural Methods recommended for Rhodesia.—Until such time as wider experience under local conditions may lead to reconsideration, the following cultural methods are recommended:—Plough the land and let it lie as long as possible before seeding. On most soils and where possible terrace the land and throw up small banks to retain the water. Open these banks and drain the land as the crop approaches maturity. Broadcast or drill the seed towards the end of September or early in October and harrow in lightly if the land is dry enough to permit of this. Where labour supply allows sow in seed beds and transplant into the larger field when the rice is about 8 inches high, spacing the plants 8 by 6 inches apart each way. Use varying weights of seeds from 40 to 80 lbs. per acre to ascertain the best rate of seeding. Weed the land once or twice if necessary. Do not allow the crop to become too ripe before cutting. Examine the ears and reap just before the grains at the base of the panicle are fully mature. Do not expect the entire crop to be dead ripe. If the rice is reaped and tied in bundles in the same way as wheat or oat forage, ripening will continue in the shock. Cap the shocks with grass or inverted bundles of rice to protect the grain from injury by the sun. Thresh the grain in an ordinary thresher used for wheat, or beat it out on a threshing floor with thin whippy sticks—heavy sticks may crack the grain.

Rice Milling Machinery.—In connection with the illustrations accompanying this article of a small rice mill installation, the following particulars supplied by the manufacturers are of interest and explain the process employed in husking and cleaning the grain preparatory to its being placed on the market in a form suitable for human consumption. The paddy, after being threshed, is fed on to the small shaking sieve shewn opposite the elevators on the extreme right of figure 2. This shaking sieve takes out any stones, strings and sand from the paddy. The cleaned paddy is then delivered by means of the first elevator into the disc rice huller shewn on the extreme left of figure 1 and the extreme right of figure 2. (Figure 1 is the front view of the mill and figure 2 the back view.) As it is not possible to hull or shell all the paddy in a disc huller without making a very large percentage of broken rice, the material coming from this machine consists of a small proportion of paddy, brown rice and husk. This material is delivered on to a shaking sieve over a blowing fan. The sieve takes out the small particles of broken rice made on the huller and the balance passes over the end of the sieve, and the husk is blown away from the rice by means of the fanner.

The mixture of brown rice and paddy then passes to the compartment separator underneath the fanner which separates the paddy from the brown or hulled rice, the paddy being returned to the huller for further treatment. The brown rice from the compartment separator is then delivered to the next machine—white rice pearling cone—by means of an elevator.

The white rice cone consists essentially of a tapered drum covered with a composition of emery which revolves inside the casing covered with wirecloth. The function of this machine is to grind off the brown inner cuticle from the rice, thus producing the ordinary white rice as produced in large mills.

When a finer finish on the rice is required, it is taken from this machine into a rice polisher. This machine is of similar appearance to the white rice pearling cone, but in the case of the polisher, the conical drum is covered with sheepskin instead of emery composition.

After passing through the polisher, the rice is again elevated and delivered on to a separator and aspirator, the shaking sieve over the aspirator grading the finished rice into three sizes, *i.e.*, whole rice and two sizes of broken, which then pass into the aspirator, which cools the rice and takes away any small percentage of dust still remaining.

Both the white rice pearling cone and the rice polisher are ventilated by means of a suction fan, the reason of this being that it is advisable, whilst milling rice, to keep it as cool as possible. In the absence of ventilation, the rice whilst being milled gets hot, and the hotter the rice, the larger percentage of broken rice there is produced.

These mills are made in various sizes ranging from 5 cwts. to 50 cwts. of finished rice per hour.

[For particulars of rice culture in the U.S.A. reference has been made to U.S.A. Department of Agriculture bulletins, Prairie Rice Culture, Culture of Rice in California and Irrigation of Rice in California.]

Report of the Veterinary Bacteriologist

FOR THE YEAR 1919.

The *routine work* of the laboratory has continued to increase, some 1,400 smears and pathological specimens having been received from Veterinary Officers, Cattle Inspectors and stock owners throughout the country. This work is of considerable importance, leading as it frequently does to the detection of disease which has not previously been recognised, so that measures can be applied by the Veterinary Department at the onset and with the greatest prospect of success. It has also to be carried out with the greatest care, for any oversight or error might lead to disastrous results. It must be remembered that specimens are not always prepared in the manner laid down in text-books, and considerable time and experience is necessary in arriving at a diagnosis from the examination of material which one might be tempted to discard as unsuitable. It is for this reason that so much time is devoted to this work, which might be more profitably given to the study of the many obscure diseases of animals which require investigation. African Coast Fever has been detected in 184 preparations, anthrax in 33, quarter-evil in 81, trypanosomiasis in 18, and epizootic lymphangitis in one.

Infectious Abortion of cattle has been detected by the application of the agglutination test in 30 out of 200 specimens of blood collected by the pipette method, which has proved very easy of application in the field, and has resulted in the receipt at the laboratory of nearly 95 per cent. of specimens in a suitable condition for the test, and the detection of fresh outbreaks in the Salisbury, Marandellas, Rusape, Concession, Lomagundi and Shangani districts. Four thousand seven hundred "massive" doses of vaccine have been issued as an auxiliary method of dealing with this disease, and most favourable reports have been received from those employing them, although it is possible that the remarkable cessation of cases is largely due to the removal of the bull from the herd for a lengthy period, the well-defined calving and service season which renders such a procedure feasible, the drying up of grasses and water-pools during the winter months, the burning of the veld, and the systematic dipping of cattle in arsenic-containing solutions. Experiments performed in this laboratory shewed the destructive influence of arsenic upon the *B. abortus*, and the deduction was drawn that the passing of cattle through arsenic-containing dips might tend to disinfect those animals whose body surface was contaminated by infective material. It was never suggested that the process might possess any curative value, as has been implied by certain manufacturers of proprietary dips.

The production of so many doses of vaccine during the early months of the year entailed a considerable amount of work, rendered all the more difficult by reason of the absence of technical staff, unsuitable laboratory accommodation, and small size of plant. The work had to be performed in a stable temporarily fitted up for the purpose, but this proved very unsatisfactory, owing to the variations in temperature and draughts which affected the incubators. The same room was also used for the culture of the quarter-evil bacillus for the production of "filtrate," but owing to the danger associated with this work under conditions where complete isolation could not be assured, it had to be abandoned.

Research Work.—It is a matter for regret that owing to the pressure of other duties, the absence of professional assistance, the lack of accommodation and facilities, very little research work has been possible during the past year. In view of the existing ignorance concerning many of the diseases of stock which handicap the pastoral industry and represent enormous losses, direct and indirect, to the country, it would appear that some provision for their investigation might be both desirable and profitable. The results which might accrue from such research are not limited to veterinary pathology, but might have an application to human medicine, a fact which has recently been recognised by the Society of Tropical Medicine and Hygiene, which has awarded the honour of its fellowship to certain veterinarians for original work in tropical countries.

Horse-Sickness.—Some desultory experiments have been carried out in connection with horse-sickness which have been rendered possible by the kindness of the Commandant General, who has provided stabling accommodation at the Police Camp and a very able and enthusiastic staff of farriers to assist. It cannot be claimed, however, that any material progress in the existing knowledge of this costly disease of equines has been achieved. It is true that the results of the application of the virus-vaccine method of inoculation have been fairly satisfactory, but the many problems associated with the cause, transmission and cure of the disease still remain to be solved. In October last a report was submitted giving the results of the inoculation of Police horses by my method from August, 1912, to July, 1919. The following tables are reproduced from that report:—

SUMMARY OF POLICE HORSES INOCULATED AND RESULTS.

Season.	Number treated.	Died under treatment.	Number of inoculated horses exposed.	Died on exposure.	Died from other causes.	Sold.
1915	6	1	5	...	...	...
1915-1916	32	2	35	...	...	...
1916-1917	115	17	133	8	6	3
1917-1918	29	6	139	7	3	...
1918-1919	38	7	160	4	1	...
	220	33 — 15%	472	19 — 4%	10	3

SHEWING NUMBER OF SEASONS SURVIVED BY INOCULATED HORSES.

Date inoculated.	Number inoculated.	Died under inoculation.	Leaving.	Seasons survived. 4.	3.	2.	1.
Prior to 1915	6	1	5	4	4	4	5
1915-1916	32	2	30	25	25	27	30
1916-1917	115	17	98	...	77	77	86
1917-1918	29	6	23	...	...	21	21
1918-1919	38	7	31	...	...	...	31

29 horses out of 35 exposed have survived 4 seasons.
106 ,, 133 ,, 3 ,,
129 ,, 156 ,, 2 ,,
173 ,, 187 ,, 1 season.

Note.—These figures include deaths and reductions from causes other than horse-sickness.

The following sentence taken from the above mentioned report may be reiterated :—

> "It must be fully recognised that the present system of inoculation, while successful as far as it goes, is by no means perfect. The inoculation of Police horses was in the first place undertaken

only upon an experimental basis in order to encourage research. These experiments proving the value of the method, imperfect as it was, led to its general application; but this has not resulted in any very marked improvement in the method for the reason that the cost of the horses prohibited those experiments involving considerable risk which are necessary in the investigation of the many problems associated with this mysterious disease. These problems must be solved before the method of inoculation can be improved, and I should prefer in future to devote my energies to purely experimental work rather than to the application of an imperfect method of inoculation."

The mortality shewn in the first table, namely, 15 per cent., does not represent the risk at the present time; the mortality during the past year was 13.8 per cent., but this included deaths among horses where the results of inoculation were unfortunately complicated by a serious outbreak of strangles among animals submitted for treatment. In the last two consignments, numbering 33 horses, two only have died, or 6 per cent., although these horses were in no way selected as particularly suitable subjects for inoculation. Twenty-seven horses purchased as experimental animals, the survivors to be used as mounts for officers of the Veterinary Department, have been inoculated, with the loss of three animals. The particular value of the inoculation lies in the proved resistance to horse-sickness of treated animals on exposure to natural infection. This has held good in most parts of the country, and the low mortality of 4 per cent. as shewn in the table justifies the continuation of the process even in its present state of imperfection.

As early as 1908 it was realised that foals possessed some slightly greater resistance to infection than older animals, not sufficient, it is true, to protect them against a full-strength virus, but such as to reduce the severity of the re-action to the virus of reduced virulence discovered about that time at this laboratory. It was not until 1916 that any practical use was made of this observation, when vaccine was supplied to certain enthusiastic breeders of horses, who applied it to their yearling colts with results which proved very satisfactory during the following horse-sickness season. This success led to a demand for a general application of the process, and during the latter part of the year an arrangement was made for the issue of vaccine to the professional officers of the Department, who undertook the inoculation of horses under two years of age, at a charge of £1 per dose, at owner's risk, and subject to certain conditions as to care and stabling. The issue was suspended at the end of December, owing to the risk of natural infection, but up to that time 207 doses had been supplied. Veterinary reports concerning 135 cases only have been received, shewing the death of seven horses or 5.18 per cent., a figure somewhat higher than had been expected. Officers, however, complain that the conditions provided for the cases undergoing treatment were not always satisfactory, and it is certain that this contributed to the death of more than one case. If this work is undertaken during the coming year it will probably be advisable to establish central camps where animals can be collected and retained under the supervision of the Veterinary Officer during the period of treatment. Some inter esting observations have been made as to the results of inoculation. District Veterinary Surgeon Myhill forwarded temperature charts of thirteen horses inoculated for the first time, and six inoculated a second time, having been treated the previous year. Ten of the thirteen shewed marked horse-sickness re-actions, but none of the re-inoculated animals re-acted. District Veterinary Surgeon Ferguson, who inoculated a number of young horses recently introduced from the Orange River Colony, remarked that they re-acted very much more severely than locally-bred animals. A filly four months old, whose mother is known to have suffered twice from horse-sickness and recovered, yielded a well-marked thermal re-action, and was visibly distressed for several days.

It is hoped that during the coming year the method of inoculation may be so improved that the general inoculation of horses may become possible; in the meantime it would appear that the inoculation of young horses might be encouraged with a view to building up the horse-breeding industry upon a foundation of young immunised mares, whose progeny can in turn be protected by inoculation. If such mares could be imported in fairly large numbers, and could be inoculated at Salisbury and be disposed of at cost price to breeders, a ready sale of such animals is assured.

"**Sweating-Sickness**" is the name which has been given to a mysterious disease of cattle, principally calves and young stock, which during the early months of the year under review assumed somewhat serious proportions. Isolated cases have occurred from time to time in the past, but at the latter part of the rainy season cases were reported from all parts of Mashonaland in considerable numbers and with a very heavy mortality, sometimes as high as 50 per cent. of infected animals. The disease was characterised by high fever, congestion of the mucous membranes, which were often of a deep-red or maroon colour, mucoid discharges from the eyes, nostrils and external orifices, and a ropy saliva from the mouth. The mucous membrane of the lips, tongue and mouth was inflamed and frequently ulcerated. The animal sometimes shewed signs of abdominal pain, was constipated and urinated with difficulty. The name "sweating-sickness" was given to the disease by laymen, from the fact that in the majority of cases the animal's body was bathed in perspiration, a condition which often persisted until death, and in cases which recovered gave place to a painful hardness of the skin, which became corrugated and cracked, often with an accumulation of waxy material and desquamated skin in the folds. In many cases on recovery the hair fell out, leaving the animal bald; and frequently large patches of skin were sloughed, leaving a wound slow to heal. The animal in such a condition presented a miserable and loathsome appearance, with sunken eyes, fœtid breath, and discharges accumulating around the natural orifices of the body becoming putrid and attracting flies. Its skin was frequently too hard and painful to permit movement, and caused grave discomfort when the animal was in a recumbent position. *Post-mortem* lesions were not specific but suggested a toxæmia, the blood being dark and tarry, the mucous membranes throughout a dirty red, and the organs congested or blood-stained; the serous cavities sometimes contained a quantity of blood-stained fluid.

Microscopic examination of the blood before and after death revealed no specific organism, and inoculation of blood from sick to healthy animals failed to transmit the disease.

A disease which was very prevalent throughout Matabeleland at the same time of the year presented many of the above symptoms, with ulceration of the mucous membrane of the mouth and swelling and cracking of the skin above the feet as a frequent sequel. This condition was generally diagnosed as "gall-sickness," the popular name for anaplasmosis, a tick-borne disease, and the Veterinary Department was called upon to explain its prevalence on farms where systematic dipping was said to have been effectively carried out for many years. Unfortunately no blood smears from infected animals were ever forwarded to the laboratory for examination, and it was therefore impossible to confirm this diagnosis. One observer recorded:—

> ". . . a serious outbreak among those of his cattle running on two parts of the farm, cattle in other camps remaining healthy."

He stated:—

> "It is significant that one large mob running on burned veld, through the midst of the area furnishing the bulk of the cases, had not one case. The various outbreaks occurred after a spell of dry weather during the hot rainy spells in January and February. A few mild cases occurred after an inch of rain in the middle of March, and four cases after an inch of rain in April. During the continuous rains of February nearly one hundred cases occurred, of which, say, twenty were fatal, and all almost identical in symptoms. Most of the animals were locally-bred yearlings."

From the above it is evident that the disease is of considerable economic importance, and in view of the fact that with the onset of the present rainy season it has made its re-appearance, some careful investigation would appear to be necessary.

Myiasis or "screw-worm" disease of cattle has been very prevalent throughout the country during the past year, causing heavy losses to stockmen through the damage done to their animals and the time and labour expended in attending to the wounds inflicted by the larvæ of the so-called "maggot-fly." This fly belongs to the genus Pycnosoma, closely resembling *P. albicans*, and deposits its eggs on or near any abrasion of the animal's surface, and the larvæ hatching from these eggs bore into the injured tissues by means of the spines which surround their segmented bodies. The commonest site of infection is in the soft tissues around the anus and vulva, but any injury such as wounds caused by branding or horning may become infected. It is believed that the puncture caused by the "striped-legged tick" *Hyalomma ægyptium* is often the primary injury, and it is true that the positions favoured by this tick are those where the abscesses caused by the larvæ are most frequently found. This tick is one of the most difficult to eradicate by dipping, and is still comparatively numerous on many of the farms where dipping has been practised for some considerable time, but where the "screw-worm" disease has been very prevalent. The larvæ of the fly, having made their way through the skin into the tissues below, form large cavities which for some time are covered by an apparently sound integument. It is only when a large area of skin sloughs, leaving an enormous cavity filled with "maggots," pus and putrid material, that the extent of the injury is realised. The larvæ burrow between the muscles and form long channels into the tissues, so that the greatest difficulty is often experienced in cleansing the wound and causing it to heal. Such agents as carbon-bisulphide, petrol, paraffin, tar, etc., have been used as remedies, their principal value being their power to destroy the maggots. Not a few stockmen have had more than a hundred cases to "dress" daily, a repulsive task, which has occupied their whole time. Prevention rather than cure should be aimed at, and it should not be difficult to obtain an exact knowledge of the bionomics of this fly and devise scientific methods for the eradication of this new and serious pest.

Distomiasis.—Within recent years the infection of cattle and sheep with "fluke" has become alarmingly frequent. The treatment of cattle with extract of male fern has proved beneficial, but the cost of this drug is somewhat prohibitive; experiments have therefore been made at the laboratory with other and cheaper drugs, but results are not sufficiently definite for publication. A remarkable feature in connection with the disease in this country is the large percentage of natural recoveries. One local butcher who has been slaughtering fat cattle and sheep from a heavily "fluke" infested farm states that although animals are sent to him in prime condition, he has in most cases to discard the livers, which are "corded," and shew that the animal was at one time heavily infected. In this connection the following paragraph from an article by Milton (*Lancet*, 24th January, 1920) on the evidence of acquired immunity in bilharziasis, an allied disease, is of interest:—

> "All helminthic infections appear to give rise to some general disturbance of the system of the host, and it is highly probable or, as I venture to think, certain that each helminth produces its own toxin, which is absorbed by its host and sets in train changes which lead to immunity not only against further harmful effects of the toxins, but render the tissues of his body inimical to the parasite itself. These changes not only lead to the death of the original parasites, but prevent the development and growth of any other parasites of the same specie, the immature forms of which may have gained entrance to his body."

Such a possibility suggests a new and profitable line of research.

African Coast Fever.—No research work has been possible in connection with this disease, although there are many problems associated with it which require elucidation. It is only referred to here in order to draw attention to certain circumstances in connection with recent outbreaks which suggest that the regular dipping of infected cattle every three days in standard solutions of arsenic may lead to a suppression of the disease. This is indicated by (1) the large proportion of deaths among oxen, as compared with other classes of cattle, on certain infected farms during the winter when tick life was practically dormant , and (2) the recrudescence of the disease in many outbreaks where regular dipping has been practised as a method of control during those months when the rainfall is heaviest. This is well indicated in the tables shewing the monthly losses in outbreaks for the last ten years.

The high mortality among oxen as compared with cows and calves cannot be solely attributed to tick infestation. Even if a number of ticks protected in the brush of the tail may escape the effects of the dip. all classes of cattle would be equally susceptible. It might, however, be due to the more rapid elimination of the residual arsenic from working animals through sweating and urinating during exercise.

It has frequently been observed that certain animals which at the commencement of an outbreak have shewn clinical manifestations of the disease have apparently recovered and have lived through the dry season to die of an acute form of the disease during the rains. It may be that in such animals highly impregnated with arsenic the development of the parasite picked up by them at the commencement of the outbreak is checked, and is only completed when the residual arsenic in them is exhausted, as might well be the case during the latter part of the rainy season, when the dipping tanks are flooded by storm waters and the dip is washed off by rains before it can be absorbed.

It was shewn by Watkins Pitchford in his report on "Dipping and Tick Destroying Agents," part 2, schedule D, that the infective process of African Coast Fever was retarded in the habituated animal, from an average period of incubation of nine to sixteen days. The number of animals comprising his experiments, however, was small, and some of the cattle exposed failed to become infected. It is possible that a more exhaustive investigation might shew that the development of the parasite in "dipped" animals is prolonged for a longer period than hitherto suspected. The possibility of a suppressed form of African Coast Fever as the result of short-interval dipping is a matter of practical importance, and deserving of the closest investigation in the laboratory and in the field.

Quarter-Evil. The alarming spread of this disease and its extension into Mashonaland drew attention to certain problems in connection with the protection of cattle by means of vaccine and other materials. One difficulty which arose was the danger of introducing the infection on to an area where it did not previously exist, by the occasional death of animals under inoculation with the vaccine made by powdered muscle of an infected animal, containing the organism in various degrees of attenuation. Such a possibility drew attention to the advisability of using, with a view to conveying immunity, the "germ-free" preparations from which the organism had been removed by filtration, and which could not therefore be the means of introducing infection on to a clean farm. Several such preparations issued by different manufacturers were available, but it was by no means certain that these would convey protection against infection with the Rhodesian strain of the disease, or would retain their efficacy after the variations of temperature to which they were submitted in transit from America to this country. It was very desirable that before issuing such materials tests should be made as to their potency, but these were extremely dangerous, if not impossible to carry out, in the field or at the laboratory, where there were no facilities for isolating experimental animals or for disposing of infective carcases and bedding. For many months such tests could not be applied, but finally, the necessity becoming urgent, experiments were made with sheep, which could be handled with greater safety, although the risks were still great and extremely difficult to overcome. From these experiments it was found that one of the proprietary "filtrates" which had been extensively used failed to protect sheep, but a second test shewed that it was more successful in larger doses than those recommended by the manufacturers. Another proprietary "germ-free" material proved more successful. However, the results obtained with sheep may not necessarily apply to cattle, and further experiments are still necessary before a definite conclusion can be arrived at. These difficulties draw attention to the unsuitability of the present accommodation and the necessity for a properly equipped establishment where such tests can be carried out without danger and unnecessary delay; and where such materials can be produced under local conditions, at cost price, and in sufficient quantities to meet all requirements, so avoiding the undesirable delay, expense and disadvantages associated with overseas supplies.

Bovine Plasmoses.—During the early part of the year a large number of cattle died from redwater and gall-sickness, especially upon farms where systematic dipping had been practised for some years. Apparently animals born and running on such farms during the years when dipping had been vigorously carried out had grown up free from infection, and when submitted to the bite of ticks introduced by accident or carelessness on to these farms, or when moved on to tick-infested veld, proved susceptible to natural infection. On those farms also where cattle had been graded up by the introduction of imported stock, the virulence of these diseases had become exalted by passage through such animals and assumed a very deadly form. To protect cattle subject to these risks, about 400 doses of virus-vaccine of low virulence were issued. Some misunderstanding seems to exist as to the object of this vaccine, which is only valuable for the immunisation of animals reared on tick-free farms, and not, as is thought, a preventive against the natural form of the disease already contracted by calves on areas which have not been freed from ticks by dipping. Indeed, it would be unwise to apply it to such animals where the artificial re-actions following inoculation might be complicated by natural infection of high virulence. The opportunity has occurred of testing the susceptibility of Rhodesian-bred animals sent from different part of the country to the inoculation camp to be immunised. These have been valuable pure-bred or grade animals, purchased at high prices from dipped areas and about to be exposed on tick-infested veld, and have come from breeders in the Shangani, Nyamandhlovu, Salisbury and Mount Hampden districts. Twenty-five of such animals have been inoculated, and sixteen have shewn redwater re-actions, but all except one have yielded a well-marked anaplasmosis re-action.

Inoculation Camp. The camp has been run as economically as possible. Crops have been grown for the feeding of animals under inoculation and experiment and those used as "bleeders," thus considerably reducing the cost of maintenance. Many improvements to the station have been carried out; roads have been made, exercising paddocks erected and thousands of trees have been planted. All this extra work has been done by the natives employed for the purpose of looking after the stock under treatment.

It is unfortunate that the difficulties and cost of freight have prevented the importation of pure-bred stock from overseas, so that the number of animals presented for inoculation has been far less than was anticipated. Only six bulls and eight heifers from Great Britain have been received, but 47 Rhodesian-bred animals have also been presented for inoculation and treatment. Sixteen horses were inoculated against horse-sickness with but one death. Seven mules were subjected to experiments, in the course of which two died. Lectures and demonstrations were given to the recruits of the British South Africa Company Police, who manifested the keenest interest in the practical demonstrations of veterinary matters likely to be of use to them in their work.

Accommodation.—The accommodation at present available is inadequate. It is manifestly undesirable to carry on experimental work on infective diseases in close proximity to valuable animals about to be distributed throughout the country. It is also extremely dangerous to carry out experiments or investigations in connection with infective diseases where isolation and the destruction of infected carcases and bedding are impossible. In these circumstances research work cannot be undertaken.

One large room has to serve as office, library, store-room and laboratory. Thus work requiring proper sterile precautions is impossible, and clerical work is performed under conditions which are unhealthy and actually dangerous. Although technical assistance is very necessary, an additional staff is impossible until increased accommodation has been provided. In view of the many costly diseases which handicap the pastoral industry in this country, some provision for their investigation should prove a profitable investment.

Forestry in Rhodesia.

TIMBER TREES IN THE UMTALI PARK.

By J. S. **Henkel**, Forest Officer.

Since forestry is primarily a commercial undertaking, it is imperative, if afforestation schemes are to be successful, that available experimental plantings of timber trees be studied and careful notes prepared of such species as have proved themselves adapted to local conditions as well as those which have not been a success. The negative results are just as important as the positive ones, since the elimination of unsuitable species prevents repetition of experiments and consequent disappointment, loss of time and money.

Where altitude, aspect, soil and climatic conditions vary within short distances, as is the case along the eastern border, it is by no means easy to determine without numerous test plantings whether any one species is the most suitable for the conditions obtaining. Time must necessarily elapse to permit the factors of the locality to find full expression. It is not an uncommon experience to find that trees which shew vigorous growth during the first few years do not maintain their vigour later in life, while others, on the other hand, shewing slow growth for the first few years, suddenly develop a rate of growth and vigour not promised by the earlier years of their existence.

Experience has also shewn that when trees are removed from their habitat, unexpected results may be obtained. For instance, some may grow vigorously, but produce inferior timber; others may grow more vigorously and produce better timber than in their habitats. In other cases trees producing inferior timber in one place may in another environment produce timber of considerable value. It will, therefore, be seen that there is wide scope for the experimentalist, and, generally speaking, the wider the range of the tests, both in species and locality, the sooner will it be possible to reduce the number of species cultivated to that which will suffice to supply the varying needs of industries dependent upon timber in one or other form.

In the neighbourhood of Umtali a fair number of different kinds of trees have been planted, many of them giving promise of maintaining their reputation for rapid growth and high quality of timber. In the present article it is proposed to deal with the trees tested in the Umtali Park. In most cases the trees are found either as single specimens or in avenues or small groups, and consequently do not give a true expression of growth such as a forester desires. The fact, however, that many, even in the circumstances detailed, shew extraordinary vigour is a happy augury for the future, and justifies the indulgence of the vision of extensive forests clothing hill and dale, where in due time the ring of the axe will be heard, as well as the hissing saw preparing the logs for thriving industries.

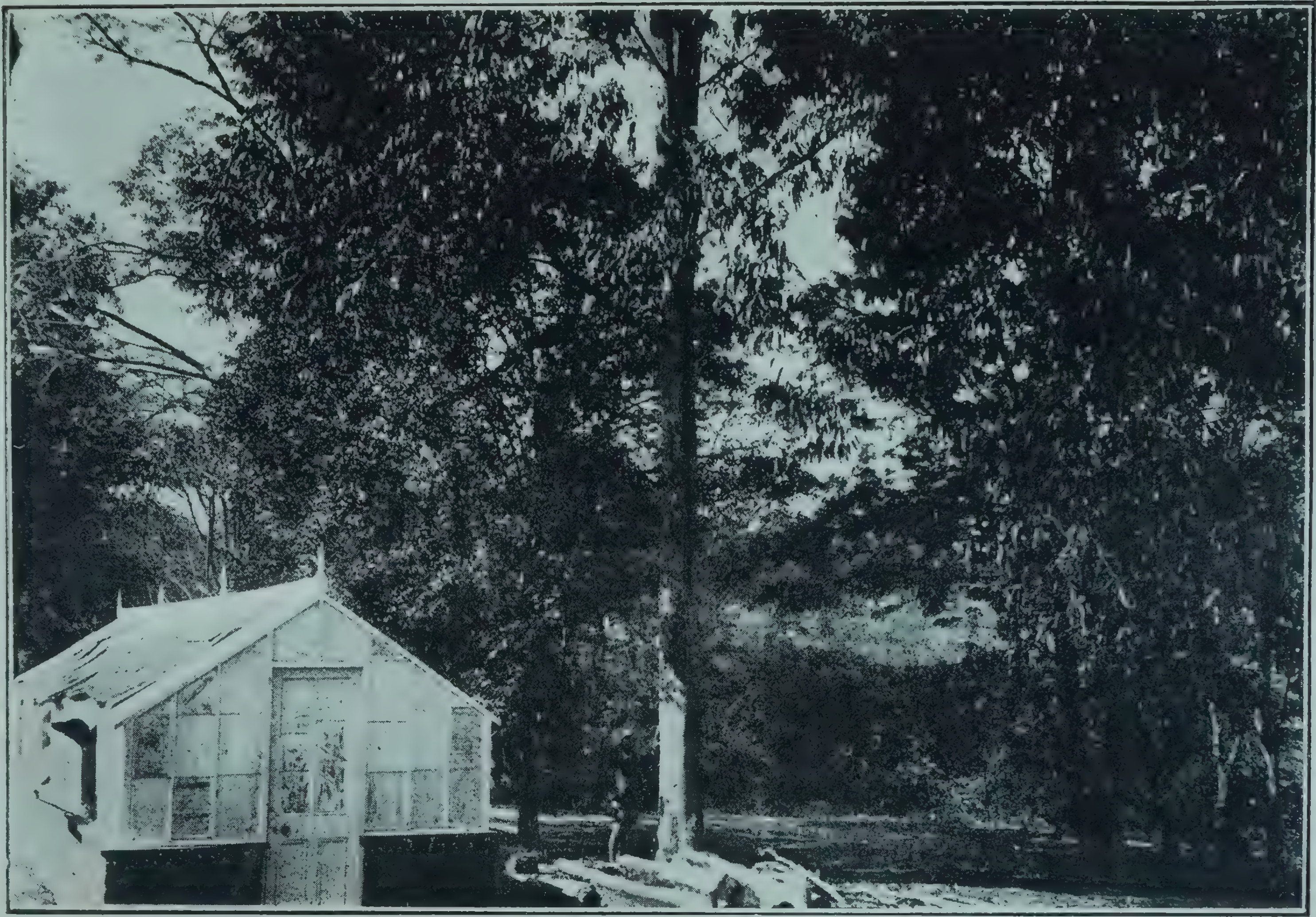
As far as can be ascertained, the first trees planted in the Umtali Park date from the year 1897. If this is so, the oldest trees would be 23 years. The species, if any, which have been experimented with and have failed, leaving no representatives in the Park, are not referred to. The following species of eucalypts are represented, namely:—

Eucalyptus crebra—Narrow-leaved ironbark.
,, globulus—Blue gum.
,, kirtoniana— ——
,, longifolia—Woolly butt.
,, maculata—Spotted gum.
,, paniculata—Grey or white ironbark.
,, pilularis—Black butt.
,, resinifera—Forest mahogany.
,, robusta—Swamp mahogany.
,, rostrata—Red gum.
,, saligna—The Sydney blue gum.
,, siderophloia—Broad-leaved ironbark.
,, sideroxylon—The red ironbark.
,, tereticornis—Forest red gum.

Amongst these, the following are not giving satisfactory results, namely:—E. globulus, E. longifolia and E. pilularis. Those of promising growth are:—E. crebra, E. kirtoniana, E. siderophloia, E. sideroxylon, E. resinifera and E. robusta. Those with good growth:—E. maculata, E. paniculata, E. saligna, E. rostrata and E. tereticornis.

The best two eucalypts appear to be the Eucalyptus paniculata and Eucalyptus maculata. The oldest representatives are 23 years of age, and are found either as single specimens or growing in an avenue mixed with other trees. In the case of the Spotted gum the average total height of the trees is about 60 feet, with a mean girth at 4½ feet above the ground of 55 to 60 inches. In regard to this tree Mr. J. H. Maiden, in his "Notes on the Commercial Timbers of New South Wales," states:—"A pale yellowish-brown timber, usually with a pretty wavy grain, which looks well under polish. It is particularly tough, and it is one of the best of our timbers for bending, even when cold. It is very durable, though its sapwood is particularly liable to decay. For wheelwrights' and coachbuilders' work it is for some uses unequalled amongst colonial timbers. Its power of bending into various shapes is very useful. It is used for cross-pieces, shafts and poles for drays, buggies, naves and spokes, handles, agricultural implements, framing and housebuilding generally, bridge decking and ship planking."

The grey or white ironbark is a tree with abundant foliage and of a pleasing appearance. The few specimens in the park are vigorous and well grown, the largest being 55 inches in girth and 70 feet in height.



Stem of spotted gum, 23 years old, girth 68 inches, height 70 feet.

Group of Chir Pine, 18 years old.

The probable age is 23 years. This eucalypt is the hardest of ironbarks and cuts almost like horn. Mr. Maiden states:—"It is to white ironbark of good quality that all the encomiums which have been passed on ironbark may be attributed. Ironbark is called the king of New South Wales hardwoods," and Mr. Maiden further states that "it is not excelled in any part of the continent for combined strength and durability. It is extensively used in bridge construction, for railway sleepers, for posts, for naves, spokes, shafts and framing by the wagon and carriage builder; for large beams in buildings, particularly in stores for heavy goods—in a word, wherever great strength is required. For such purposes as railway sleepers it will last an indefinite period, and in many cases has to be taken up not because it shews signs of decay from exposure on the permanent way or disintegration because of the vibration to which it has been subjected, but because holes have been made in the sleeper by the removal of bolts and spikes. I have seen sleepers which have borne the heaviest traffic of the main line near Sydney for twenty-five years and which are as sound as the day they were laid."

The Sydney blue gum is another useful timber. The small group of this species is thirteen years old, and contains the tallest trees in the park. In regard to this timber Mr. Maiden states that it is of a pale red colour, straight in the grain, comparatively easy to work, and, therefore, for a hardwood, a favourite with carpenters. It is largely used by shipwrights and wheelwrights, and is a very useful hardwood. It is extensively used for building purposes, ships' planks, etc., and is the most widely used of our timbers for felloes of wheels. Although this timber varies a good deal in quality, much of it is very durable.

Red gum and forest red gum are timbers better adapted for the drier parts of Rhodesia. These trees have not the upright habit of growth common to the ironbarks and Sydney blue gum. The reason may be that an inferior strain has been introduced into the country. By proper seed selection from straight growing specimens and careful pruning in early youth straight stems can be secured. It is probable that these trees will be more extensively cultivated in Southern Rhodesia than any other exotic. In regard to the red gum, Maiden states that its timber is red, strong and durable, resistant to fungus disease, white ants, teredo, etc.

In the park there are one or two fair specimens of forest mahogany. According to Maiden the timber is a rich red colour, very durable, and becoming very hard with age, even as hard or harder than ironbark, resistant to white ants and does not discolour paint. Forest mahogany is often sold as Jarrah, which it closely resembles, and for which I believe it is a perfect substitute. This tree deserves to be extensively cultivated in the moister parts of the eastern border.

There are many other valuable eucalypts not represented in the Park, such as Eucalyptus obliqua, messmate or stringy bark; Eucalyptus microcorys, tallowwood; Eucalyptus botryoides, botryoides gum; Eucalyptus corymbosa, bloodwood, etc. All these should do well on the eastern border.

Other hardwoods are represented by the following species:—

Albizzia lebbek—The siris tree.
Acacia decurrens var. mollis—Black wattle.
,, ,, var. dealbata—Silver wattle.
,, melanoxylon—Blackwood.
Grevillea robusta—Silky oak.

With the exception of the Siris tree, the conditions in the Park are unfavourable for the proper growth and development of the aforementioned trees, since they require deep soil and a moist climate.

The trees producing soft woods are represented by the following species:—

Araucaria cunning hamiana.
,, excelsa.
Callitris robusta—White cypress pine.
,, calcarata—The black pine.
Cupressus lusitanica—Portuguese cypress.
,, sempervirens var. horizontalis—Common spreading cypress.
,, ,, var. pyramidalis—Common upright cypress.
Cryptomeria japonica—Cryptomeria.
Cedrela toona—Toon tree.
Cinamomum camphora—Camphor tree.
Jacaranda mimosæfolia—Jacaranda.
Khaya nyasica—Mahogany.
Melia azedarach—Persian lilac.
Pinus longifolia—Chir pine.
,, halepensis—Aleppo pine.
,, canariensis—Canary pine.
,, pinaster—Cluster pine.
,, pinea—Stone pine.
Podocarpus sp.—Yellow-wood.

Amongst the softwoods the tree which has given the best results is the Pinus longifolia. The group consists of 58 trees planted on an area 28 yards by 10 yards. The dominant trees have a height of 55 feet. By counting the annual rings of a sample tree the age was ascertained to be 18 years. The plot has not been thinned, with the result that diameter increment has suffered. Discarding seven suppressed trees under three inches in diameter at breast height the remainder fell into the diameter classes as under:—

3 inches	4 trees
4 ,,	5 ,,
5 ,,	8 ,,
6 ,,	9 ,,
7 ,,	6 ,,
8 ,,	10 ,,
9 ,,	6 ,,
10 ,,	1 ,,
11 ,,	2 ,,
Total	51 ,,

The calculated sample tree equals 6.8 inches in diameter. The sample tree felled was 52.8 feet in height. The under-bark volume down to a diameter of 1.5 inches and 46 feet long equals 4 cubic feet. The volume per acre is approximately 3,600 cubic feet or 200 cubic mean annual increment. The trees were exceptionally healthy and well grown, as will be seen in the accompanying photograph.

Pinus longifolia is a native of India, and is a large more or less deciduous tree of gregarious habit, forming pure forests of great extent. In India the timber is used for building houses and boats, making tea boxes, shingles, etc. The tree is also the chief one tapped for resin.

The several species of cypress are producers of valuable timber, and should be extensively cultivated, as well as the toon tree and jacaranda.

Species which are not giving good results are cryptomeria, camphor, aleppo, cluster and stone pine, araucaria and podocarpus.

While the canary pine shews fair growth, it compares unfavourably with the chir pine; the same may be said of the various species of callitris.

Farmers and others interested in tree culture, and possessing land with conditions similar to those in Umtali Park, will find it well worth while visiting the Park and obtaining seed of the best trees growing there for afforesting their own lands.

An Indian Dhal Recipe.

Soak two or three tablespoons of dhal in cold water for two hours, strain off and boil in stock until *quite soft*, season to liking and put some shredded fried onion on the top; serve in a hot dish surrounded with *well* boiled rice; a little fish mixed through sometimes makes a change.

Development of Flavour in Butter.

By T. HAMILTON, M.A., N.D.D., Dairy Expert.

The following is the scale of points used in judging butter:—

	Maximum Points.
Flavour and aroma	50
Texture, including body, grain and moisture	30
Colour	10
Salting	5
Finish and general appearance	5
Total	100

For flavour and aroma are given the most points on the score card, and it is very largely on these qualities that the butter grader classifies the sample.

Various terms are used in describing the flavour of butter, and those interested should make themselves acquainted with them. It is impossible to describe on paper the various flavours to be found in butter, but a good flavour can be defined as something that is pleasing to the palate and which leaves the delicate, "nutty," full flavour of cream in the mouth. A butter grader is born and not made, and unless he has a discriminating and delicate palate, he can never become a first-class man at his work. A man's palate may easily become tired, and where large quantities of butter are required to be graded there are usually two or three graders present to check each other's decisions. As a rule two or three hours' grading at a time is a long enough period for this exacting and responsible work. The following are the chief terms used in describing flavours which are otherwise than good:—Insipid, tallowy, rancid, cheesy, stale, mouldy, woody, fishy, bitter, sour, cowy and weedy. Insipid flavour is a very common South African fault. As a rule it is due to churning insufficiently ripened cream. Sometimes it may be partially due to the overwashing of the butter whilst in its granular stage. Washing the butter is a necessary operation, but if properly churned, two washings are ample, and at the second washing the water should be perfectly clear, and all buttermilk washed out. Insufficiently ripened cream being one of the chief causes of this fault, the butter maker should pay particular attention to this important detail. There are two methods of ripening cream. The first is natural ripening, and the second is ripening by means of a starter.

Natural Ripening.—After the cream has been separated it should be at once cooled down by immersing the vessel containing the cream into cold water, and it should be frequently stirred to reduce the temperature as rapidly as possible. Usually, except in the very hottest weather, it will be possible to cool the cream down to 70° F. by this means. All cream as it comes from the separator should be similarly treated before being put into the ripening can. If the can is not full and further cream is added, it should be cooled to the same temperature. The mixture of fresh cream and partially ripened cream should be frequently stirred. A word of warning should be given here regarding the danger of adding fresh cream to fully ripened acid cream. This danger lies in the fact that: (1) The creams do not mix well; (2) the sour cream churns more rapidly than the sweet cream and there is consequently a heavy loss of fat in the buttermilk; (3) the acid in the fully ripened cream curdles the fresh cream and the casein in it becomes lumpy. These lumps are difficult to get rid of by straining and will often cause "mottling" or white specks in the butter.

These disadvantages of course do not apply to the mixing of fresh cream with partially ripened cream where the development of acid is so slight as to be almost inappreciable to the taste. Cream for churning should never be mixed with fresh cream for at least 18 hours before churning, as if ripe enough for churning it will have enough acid developed to cause the faults described above. Usually cream ripened between 70° and 80° F. will be fully ripe for churning in two days. In winter it will take three days or more for sufficient acidity to develop.

In order that a good flavour may be developed the ordinary precautions regarding the production of clean milk should be observed; the atmosphere of the dairy should be pure, no tainted articles such as meat, vegetables, fruit, etc., should be in the same room with the cream, and the cream should be kept cool and well stirred. This natural ripening of cream has its advantages, and if carefully carried out will usually result in a clean flavour being produced, but it has the great disadvantage that other germs may develop and hinder the rapid and proper development of the lactic germ.

Ripening by Culture Starters.—To overcome this disadvantage and to ensure a more uniform product being produced, the ripening by means of pure culture starters has been introduced in most dairying countries, especially in New Zealand and Denmark. In these countries, however, the usual creamery practice is for the farmer to send his milk to the nearest creamery, which is generally not more than three or four miles distant. Here the milk is separated and the cream at once "pasteurised." This means that the cream is heated to a temperature of 180° F. by means of steam and then rapidly cooled down to 70° F. By this treatment the cream is practically rendered free from any active germs. The pasteurised cream is then inoculated with about 2 to 3 per cent. of pure culture "starter," and the whole ripened until about 6 per cent. lactic acid is developed, when it is ready for churning. Great attention is paid to the development of these culture starters, and in the bigger creameries they are subjected to bacteriological tests to ensure that they contain the germ required for the full development of flavour. In this way a uniform product is turned out, the flavour and aroma of which is practically constant throughout the season. This system of pasteurisation and inoculation can be applied to the home ripening of cream.

Preparation of Milk. After thoroughly cleansing and sterilising the vessel or bucket, pour in one gallon of sweet separated milk. Separated milk is preferable to whole milk, because the action of centrifugal force has thrown out all foreign matter and most of the germs on to the outside of the bowl, where they accumulate in the separator slime. By this means the separated milk is much cleaner and free from germ life than the whole milk.

Heat the milk to about 180° F. by immersing the bucket in boiling water, and keep it at this temperature for about fifteen minutes; cool rapidly to about 70° F. by placing the bucket in cold water and stirring constantly.

Special starter cans are made so constructed that heating and cooling can be rapidly effected, and a stirrer is provided which passes through the lid, by which the contents can be stirred without exposing the milk to risk of contamination.

Inoculation of the Milk.—A bottle of the pure culture preparation is poured into the pasteurised milk and stirred with a sterilised spoon. The vessel is covered with a sterilised muslin and put into a room the atmosphere of which is sweet and cool. In about twenty or thirty hours the milk should become sour and coagulate. If for any reason, such as cold weather, the milk does not shew any signs of coagulation in this time, it should be gradually raised to about 90° F. by immersing the vessel in warm water. After this treatment coagulation should occur in two or three hours.

Propagation of Starter.—Pasteurise sweet separated milk as before, taking great care to ensure that the vessel is perfectly sterile before the separated milk is placed in it. Skim off the top of the thick coagulated milk and add to the newly cooled pasteurised milk about from 2 to 5 per cent. of the thickened milk. Stir thoroughly and leave to thicken. It should coagulate in twenty to twenty-four hours and present a smooth appearance. When a starter is first prepared it generally has an undesirable taste and smell, and until the third inoculation it should not be used for ripening the cream. If great care is exercised, a starter inoculated from day to day should remain good for a considerable period. When, however, it loses its smooth appearance and its pleasant, sharp smell and taste, and shews any signs of gassiness, it should be discarded.

The usual method of ripening cream employed in creameries and up-to-date dairies is to submit the cream as soon as possible after separating to a temperature varying from 170° to 180° F. This is done in the creameries by means of a pasteuriser worked by steam, but it can be done on the farm in precisely the same manner as was adopted in pasteurising the milk for the preparation of the starter. When the cream is cooled sufficiently it is inoculated with about 5 to 10 per cent. of the pure culture starter. It is well stirred and allowed to stand for twenty-four hours, when, if maintained at the proper temperature, it should be ripened sufficiently for butter-making, and should possess that delicate flavour and aroma which is so much desired.

(*To be continued.*)

The Manuring of Maize at Makwiro.

By G. N. Blackshaw, O.B.E., B.Sc., F.I.C.,
Government Agricultural Chemist.

During the past season (1919-20), certain manurial trials have been conducted by the Agriculturist's branch of the Department in co-operation with Mr. E. Smith on the farm Cromdale, Makwiro, for the purpose of acquiring information regarding the effect of various manures upon the yield of maize on the black vlei soils of the Makwiro district.

The vlei land selected for the experiment on Cromdale is on a gentle slope, and each plot extended from the foot of the vlei for a distance of 200 yards up the slope. Each manurial treatment was given a trial in duplicate, the size of the plots being half an acre in all cases except those which received the dressing of basic slag and nitrate of potash, each of which was one-quarter acre.

The chemical composition of the first nine inches of the soil under trial was as follows:—

No. 156 G—Sample of surface soil to a depth of 9 inches. Taken from high side of plots.

No. 158 G—Sample of surface soil to a depth of 9 inches. Taken from low side of plots.

Analysis of air-dried fine earth (portion passing through 3 m.m. sieve). Sample treated with hydrochloric acid (sp. g. 1.12) and digested for 48 hours on a water bath.

No.	156 G.	158 G.
Probable geological origin.	Felspar-rich norite.	
	Per cent.	Per cent.
Total loss on ignition	18.52	24.14
Silica and refractory silicates	57.07	50.12
Ferric oxide and alumina	21.24	23.13
Lime (CaO)	1.90	1.53
Magnesia (MgO)	0.98	1.57
Phosphoric oxide	0.026	0.032
Potash (K_2O)	0.069	0.062
Nitrogen	0.11	0.14

Soluble in 1 per cent. citric acid solution—100 grams fine earth extracted for one week with 1,000 c.c. citric acid solution.

Phosphoric oxide	0.0016	0.0044
Potash (K_2O)	0.0062	0.0130
Lime (CaO)	0.271	0.437
Magnesia (MgO)	0.258	0.447

The materials used in the trial were as follows:—

(a) "*Maize*" *fertiliser* containing 2 per cent. nitrogen, 9 per cent. phosphoric oxide soluble in water, 12 per cent. total phosphoric oxide and 3 per cent. potash. (Nitrogen present as nitrate and organic, and potash as nitrate.)

(b) "*General guano*" *fertiliser* containing 3 per cent. nitrogen, 6.9 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution, 9.5 per cent. total phosphoric oxide and 3 per cent. potash. (Nitrogen present as guano, dried blood and bone, and potash as plant ash.)

(c) *Basic slag* containing 13.5 per cent. phosphoric oxide soluble in 2 per cent. citric acid solution and 18 per cent. total phosphoric oxide. *Nitrate of potash* containing 13.8 per cent. nitrogen and 46.4 per cent. potash.

(d) *Lime* containing 58.29 per cent. slaked lime (calcium hydrate) and 14.2 per cent. calcium carbonate. This material was damp when the sample was taken and contained 16.9 per cent. of moisture at the time of analysis.

(e) *Kraal manure* produced on the farm.

On 18th November, the kraal manure, lime, "general guano" fertiliser, basic slag and nitrate of potash were applied and the land disc harrowed. All the plots were then planted with selected seed of the Salisbury White variety on 18th and 19th November and the land drag harrowed. On 27th November, the "maize" fertiliser was applied and harrowed in (this dressing had not arrived in time for application at the same time as the other fertilisers).

The following record of the germination of the seed and also of the after-cultivation of the plots has been supplied by Mr. Smith:—

"8th December, germination on plots very irregular, found that a number of young plants had been destroyed by insects; 9th and 10th December, cultivated plots; 13th December, hand-weeded; 29th December, land too wet for cultivators; 3rd January, ridging plough working in plots, but land very wet; a lot of plants 'drowned out' on lower side of plots; 10th and 12th January, cultivators working; 20th April, reaping; 26th and 27th April, shelling and weighing the crop."

Owing to the heavy rains during the season, the land on the bottom side of the plots became very water-logged, consequently the lower half of each plot was cut out of the experiment and the return on the upper half only was recorded. The returns per acre given later are therefore calculated from the yields obtained from a quarter of an acre in the case of each manurial dressing except the "basic slag, nitrate of potash" dressing, which are based on the returns from one-eighth acre plots. The details of the manurial dressing applied to each plot and the yield of grain obtained are given in the following table:—

Manurial dressing—rate per acre. (Particulars regarding the composition of the materials used are given earlier in this article.)	Total yield of grain per acre.		Increased return per acre.		Percentage increase per acre.		Cost of manurial dressing per acre (1919 prices).
	On duplicate plots.	Average of two plots.	On treated plots.	Average of two plots.	On treated plots.	Average of two plots.	
	lbs.	lbs.	lbs.	lbs.			
1. No manure	1,012 992	1,002	... ...	...	... ...	...	...
2. Kraal manure, 10 tons ... (Approx. 25 Scotch cart loads of fairly ripe, moist manure)	1,520 2,160	1,840	518 1,158	838	51.7 115.5	83.6	...
3. "Maize" fertiliser, 150 lbs. ...	1,264 1,480	1,372	262 478	370	26.1 47.7	36.9	27/-
4. Basic slag, 150 lbs. Nitrate of potash, 30 lbs. ...	1,160 1,400	1,280	158 398	278	15.7 39.7	27.7	40/-
5. "General guano" fertiliser, 250 lbs.	1,408 1,680	1,544	406 678	542	40.5 67.6	54.0	27/-
6. Lime, 500 lbs.	820 1,368	1,094	182 366	92	18.1 36.5	9.2	21/9
7. Lime, 1,500 lbs.	1,092 1,400	1,246	90 398	244	8.9 39.7	24.3	65/3

On reference to the table, it will be noted that the yields on the duplicate control (no manure) plots are in very close agreement. This is particularly fortunate, because deductions can be drawn with greater assurance from a comparison of the returns on the untreated and treated plots in spite of the fact that the respective returns on the duplicate treated plots in the case of each dressing show considerable variation.

The wide differences in the yields on the respective duplicate treated plots may have been due to several causes which, in practice, it is difficult and well-nigh impossible to avoid in field experiments, but when the yield of grain on duplicate plots receiving a specified manurial dressing exceeds *on both plots* that obtained on the control plots by more than 10 per cent., it can reasonably be deduced that the manurial dressing has had a beneficial influence upon the crop return on the soil under experiment.

Accepting this as a basis of interpretation, it is inferred that dressings Nos. 2, 5, 3 and 4 each effected an improvement in the yield of maize, the correctness of this inference in the case of No. 4 being somewhat doubtful, because the return from one plot receiving this dressing exceeded that from the control by 15.7 per cent. only.

In view of the fact that the yield from one plot receiving dressing No. 6 was less than that from the control, and that the return from one receiving No. 7 only exceeded that from the control by 8.9 per cent., there is no definite indication that lime had any material influence upon the yield of grain in the first year after its application.

From a study of the composition of the soil, it is reasonable to conclude that the land selected for the trial does not require lime. Cromdale is situated on the Great Dyke, and the results of analysis indicate that the soil under experiment is derived from felspar-rich norite, a rock occurring in the Dyke formation, which is richer in lime than magnesia: a sample of this rock analysed at the Agricultural Laboratory contained 14.6 per cent. of lime (CaO) and 7.1 per cent. of magnesia (MgO). On the other hand, some of the rocks of the Great Dyke, *e.g.*, enstatitite and serpentine, are characteristically rich in magnesia and poor in lime, and on soils derived from these rocks an application of lime would be more likely to improve the crop returns.

On making a general comparison of the effects of the respective manurial dressings, it will be observed that the influence upon the yield of maize was particularly marked in the case of kraal manure, a fact which corroborates past experience in the district.

Throughout the season it was clearly evident that the plots dressed with kraal manure were making the best growth, followed by those dressed with "general guano" fertiliser and "maize" fertiliser in the order given. The growth on the plots dressed with "basic slag and nitrate of potash" and with lime did not stand out in comparison with the control plots.

The immense value of kraal manure for crop production leads us to a brief consideration of the question of its production on the farm, for, until a farm is fenced and divided into paddocks, the farmer must of necessity kraal his cattle, and as long as the kraaling of cattle is continued the opportunity is given to produce a considerable quantity of kraal manure each year on the average farm.

The annual output of kraal manure on the average farm is only sufficient to dress a very few acres, but more undoubtedly can be produced on the majority of farms by the liberal use of litter in the kraals during the wet season.

Realising its importance, Mr. Smith of Cromdale has, of late years, devoted special attention to the manufacture of kraal manure, with the result that he has been able to improve the crop returns from a greater acreage of his lands than would otherwise have been the case, and, at my request, he has very kindly supplied the following useful information upon the practice followed by him since the latter half of 1917.

The system adopted at Cromdale is to build a number of stacks of veld hay in the kraals during the latter part of the dry season. To these stacks the cattle have free access whilst in the kraal, and any hay which is not consumed or has not already been trampled under foot is finally spread out. As occasion demands, and at other times when convenient, the manure is gathered into heaps and sweated. This periodical gathering of the manure into heaps serves not only to keep the kraal clean, but also to facilitate the ripening of the manure and the germination of any seeds therein, thereby reducing very considerably the weed growth which is liable to develop so abundantly on land dressed with kraal manure taken direct from the kraal and applied without having been previously sweated.

Previous to 1918 the quantity of manure produced annually on Cromdale was only sufficient to dress five to six acres, but since the system outlined above has been followed sufficient has been produced each year to dress 25 to 30 acres at the rate of about 40 Scotch cart loads (approximately 16 tons) per acre. The average number of cattle kraaled was 250 to 300 head. Applied at the rate of about 10 tons per acre (which is a good dressing), the *annual* output of kraal manure on the farm during the past two years was sufficient to dress about 40 acres.

In preparation for the coming wet season, it is the intention to cut a supply of grass, that is too rank for feeding purposes, for use as litter in the kraals to supplement the residue of the hay crop. By so doing, the manure supply will be further increased, and at the same time the grazing will be improved.

As an alternative to kraal manure, green manuring with velvet beans is being given a trial on limed and unlimed plots at Cromdale. The plots were planted with velvet beans last wet season and the crop was ploughed under before the land had dried out. These plots will be cropped with maize next season.

In conclusion, it should be mentioned that these experiments have been supervised by the officers of the branch of the Agriculturist and Botanist in co-operation with Mr. Smith of Cromdale, to all of whom the writer is indebted for many practical suggestions embodied in this report; also to Mr. Flack, Assistant Chemist, for the soil analyses.

Round-worm Infection of Calves.

By H. E. Hornby, M.R.C.V.S.,
Government Veterinary Surgeon, Northern Rhodesia.

Calves are most liable to heavy infestation with these worms during the first six months of the year. *Post-mortem* examination may reveal their presence during the other half-year, but, generally speaking, the trouble dies down as the mud dries up.

The worm is *Ascaris vitulorum*, and it is found all over the world; but reports of its ravages indicate that there are few places where it does so much harm as it does in South Africa. The female is larger than the male, and when full-grown she measures from 8 to 12 inches in length. The male is from 6 to 10 inches long. As adults, they are found only in the alimentary tract of calves, for the most part in the small intestine, though occasionally an odd one is found in the stomach or even in the bile-duct. I have never found them in old stock; in fact, one can say that they cause trouble only to sucking calves. These, however, may shew symptoms of infestation when only a fortnight old, though they are never infected before birth.

Mating of the adult worms takes place in the calf's intestine, and the female commences to lay a prodigious number of eggs; as many, it may be, as several thousands a day for weeks on end. These eggs are passed out with the calf's dung, and they are readily demonstrable therein by means of a microscope.

Ascaris ova form no exception to the rule that eggs require warmth and a certain amount of moisture to aid their development. I have taken the undifferentiated eggs and put them in a dry place in my laboratory and found them incapable of developing after a month's desiccation. In clean water at a temperature of 50° to 70° F. the eggs developed slowly, but most of them produced larvæ in from four to eight weeks; these larvæ, however, did not survive very long in the same medium, but were all dead four months after the commencement of the experiment. If egg-containing fæces are put into water, which thereby becomes filthy and stinking, the ova will not develop, but will quickly be killed by the germs or toxins of putrefaction. The most favourable conditions for their development are when the eggs are kept warm and moist but still fully exposed to the air, and these conditions are met with in the surface layers of the soil during and just after the season of summer rains. Then the eggs will be found to contain fully-formed embryos at the end of a fortnight. Unless squeezed out, the larvæ do not escape from the egg-shells.

Infection of the calf takes place through ingestion of larvæ, generally while these are still unliberated. Eggs eaten before they have reached their full development are harmless. It is easily understood how, when a herd is infected, all the soil, litter and grass contaminated by calf-dung may become, two or three weeks later, rich cultures of larvæ. Consequently cows' udders become soiled with infectious material, and so even with its first milk a calf may take in many eggs, each of which is a potential large worm. Afterwards, everything taken into its mouth, if the ingested material happens to be soiled, may raise the worm population in the calf's intestine.

It can be understood now why the trouble is at its worst, at any rate in Northern Rhodesia, about April. That month is the last of six warm rainy ones during which a large proportion of eggs has been able to develop fully. As the ground around the calf pens becomes dryer and colder, an increasingly great percentage of the eggs fails to develop, so that calves born in the winter escape heavy infection. I have mentioned above that unsegmented eggs will not bear prolonged desiccation, but it is probable that eggs with contained larvæ are more resistant. What inclines me to this belief are the facts that one dry season does not appear to suffice to clean infected soil, and that I have seen a larva—the subject of the illustration—which was definitely ensheathed and therefore likely to be able to withstand drought in the same way as do the ensheathed larvæ of the twisted wire-worm (*Hæmonchus contortus*).

If at the beginning of the rains a few calves get infected by larvæ which have survived the drought, their dung will soon be laden with eggs. By Christmas the ground will be badly soiled and the calves will be becoming heavily infected. Soon there will not be a calf between the ages of three weeks and six months which is not passing each day hundreds of thousands of eggs, so by April there is hardly a cubic inch of superficial soil in the neighbourhood of the pens which does not harbour larvæ. As the ground dries, fewer and fewer eggs find favourable environment, and many larvæ hatched during the rains die. Thus, as the adult worms, which are not long-lived, die in the intestine and are digested or excreted, they are not replaced, and so by about August the calves may still harbour a few worms, but they are rarely heavily infested. These remarks do not apply when calves have free access at all seasons to wet land which, even in the winter months, may be suitable for egg-development.

After ingestion by the calf it is presumed that the egg-shell is softened by the gastric juices, and the contained tiny larva is liberated. A certain number, too, may be liberated mechanically during mastication or even outside the body.

Until recently it was taken for granted that once it was set free in the stomach the tiny worm made its way to the small intestine and there it just grew up. Recent work by F. H. Stewart and by B. H.

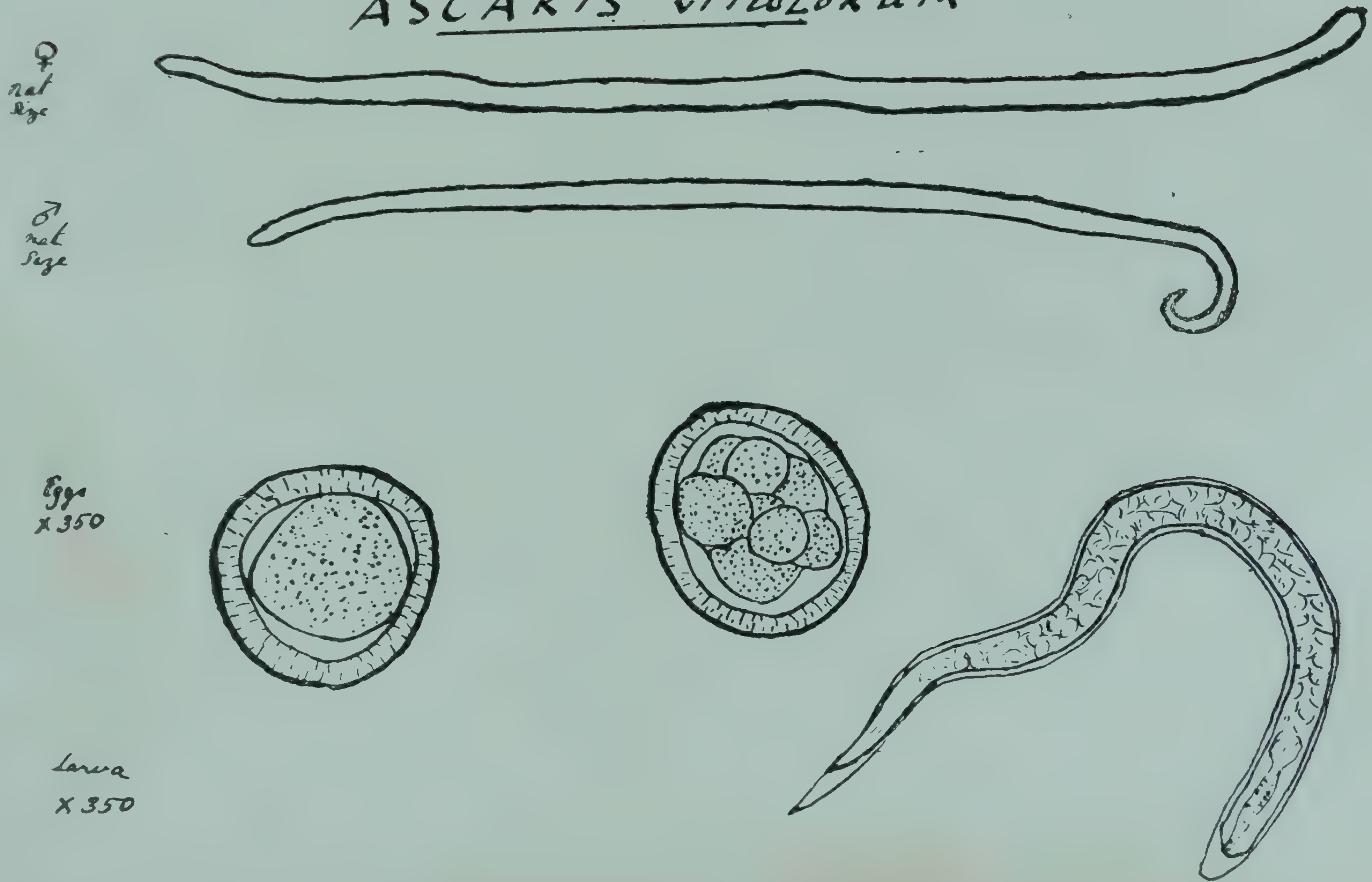
Ransom has shewn that in the case of the pig-ascaris the larvæ do not at once settle down in the intestine, but migrate to various other organs including the liver, spleen and lungs. Within a week the migrating larvæ may be found in the lungs and have meanwhile undergone considerable development and growth. From the lungs the larvæ migrate up the trachea and into the œsophagus by way of the pharynx. Upon reaching the alimentary tract a second time after their passage through the lungs, the larvæ settle down in the intestine and complete their development to maturity.

This may be the case with *Ascaris vitulorum*, but I have not been able to demonstrate it. The peripatetic nature of my occupation has hindered me from making careful dosing experiments, but I have made a number of *post-mortem* examinations of calves which up to the days of their deaths were subject to infection, yet never have I succeeded in finding worms outside the alimentary tract. One day I saw a two-months-old calf pass some loose, greyish-yellow dung. Although in good condition it was tucked up, its mucous membranes were cyanosed, it was blowing badly and suffering from a short dry cough. As its fæces were rich in eggs and it was shewing these symptoms of pulmonary trouble, I thought that it, if any, should shew worm-infection of the lungs. Accordingly I killed it. The small intestine was packed with hundreds of worms, mostly full-sized. The apex of the left lung shewed definite lesions of pneumonia. I cut out the affected piece, slit open the bronchi and washed them with clean water, in which I searched afterwards for larvæ. Not one did I find. I have had the same experience with other cases.

Whether development is accomplished wholly in the intestine or not, it is certain that it is very rapid. I examined a two-weeks-old calf, and in its intestine I found dozens of worms ranging in length from 1 to 7 inches. I have often found eggs in the fæces of calves not more than a month old. This rapid growth is at the expense of the host, although, strange to say, I do not think it is definitely known in what form the worm takes its food, but the most generally held opinion is that it sucks the blood of its host. It is certain that heavy ascaris infection produces profound anæmia.

In addition to causing loss of blood, worms act as foreign bodies in the intestine, causing nausea, colic and diarrhœa. They wound the mucous membrane even to the extent of sometimes causing veritable perforations. They may block up the duct by which the bile is discharged, and so cause jaundice. The irritation of the intestinal walls may set up nervous reflexis and provoke convulsions and epileptiform fits. Much has been written on the subject of toxins produced by ascaris. One such substance causes difficulty of respiration, dilatation of the peripheral blood vessels, intensification of the secretions and excretions, nervous disturbances, depression of the temperature and blood pressure. To protect itself from the digestive juices of its host the worm turns out an anti-enzyme. This anti-enzyme is destroyed by alkali, and this may be a key to the solution of the mystery why the worms can only survive in young animals.

ASCARIS VITULORUM



It is said that veal made from a worm-infested calf has an unpleasant taste. I have never noticed this myself.

The symptoms of infection are: The calf is not thriving; it is tucked up; its appetite is capricious; its coat stares; its visible mucous membranes are pale and bluish; it is dull and listless; its dung tends to be loose, is nearly always stringy, generally greyish-yellow, rarely markedly offensive in odour, and may contain recognisable fragments of worms. The animal tends to blow with the slightest exertion and is liable to attacks of colic. If the bile-duct is choked the animal's membranes are very yellow. If the intestine is perforated, peritonitis and blood-poisoning may result and the beast die quickly. It may have an epileptiform fit, or the hindquarters may be paralysed.

Diagnosis during life can only be made with certainty when distinct fragments of worms are found in the dung, or if a microscope is used for the detection of eggs. With reference to the former, although by no means every evacuation shews worm contents, yet many do, and a look through the calf house will reveal many whole or parts of worms. Sometimes part of a worm is seen protruding from a calf's anus; not infrequently the parasite in such cases is surrounded by a number of distinct rings of hard dung.

The *post-mortem* examination of a calf infected with worms will reveal a number of the parasites in the small intestine. In bad cases the bowel is dilated and the outline of worms can be seen readily through the stretched coats. There are no constant lesions detectable by the naked eye; even the mucous membrane of the intestine shews only slight congestion and tiny blood extravasations. There are generally localised patches of pneumonia, which may be due to the migration of larvæ or to the action of the worm-toxin.

Treatment should be preventive and curative. The latter is not very satisfactory. After a trial of all the ordinary vermifuges which are accessible to the stock owner I decided that turpentine was the most effective. I found that a dose of two drachms was safe but inefficacious; on the other hand a one ounce dose killed or expelled all worms, but was toxic to the calf. The system of dosing which I recommend, but which demands an extensive trial yet before being definitely approved, is to give on two successive mornings from two to four drachms of turpentine in two ounces of a mixture of linseed and castor oils. After an interval of a week one should give a third dose. In order not to upset milking arrangements I dose the calves first thing in the morning and then let them go to their mothers.

In conjunction with my friend Mr. C. Tapson of Government Farm, Fort Jameson, I tried the effect of Cooper's Dip Tablets. We found that any but the tiniest calves could be given three tablets a week for two weeks without setting up symptoms of poisoning. We gave a single tablet on two successive days, then missed a day and gave a third. At the end of the fortnight an experimental calf's dung was still rich in eggs. Nevertheless the vermicidal value of the tablets was shewn when a calf died after it had received seven in one week subsequent to a month's course of weaker dosing, and on *post-mortem* examination it was free from worms. It is conceivable that two tablets at a time given once a week for a month will assist in keeping down the worm population in a herd, but there is always a risk attached to the use of proprietary drugs

Preventive treatment is better than curative. We have seen how a calf becomes infected and we have learnt that adult stock do not harbour worms. Do not let your in-calf cows come on to land soiled by worm-infested calves, and make sure that your calving places are on clean land. Then when a cow calves, her udder is clean—you can take the extra precaution, if you like, of washing it well prior to parturition —and the herbage at which the calf picks is likewise clean. The objection to this course, you say, is that it demands doing away with the old buildings and constructing new ones. It does. If you are not prepared to do this, then you can try the effect of thoroughly cleaning out your old places, of washing the cows' udders prior to allowing their young to suck, of feeding only from racks and mangers; in fact of trying everything which will prevent any stuff which may be soiled with old calf dung from being licked or eaten by susceptible animals.

Shorthorn Society of South Africa.

The Annual published by the Shorthorn Society of South Africa will shortly be issued, and anyone interested in Shorthorn cattle in South Africa should make early application for a copy to the Secretary, Cuthbert A. Pope, Box 173, Queenstown, C.P.

Poultry Husbandry.

By A. Little.

TREATMENT OF ADULT BIRDS IN PENS.

Housing.—The three main points in the housing of fowls are:—

(1) Ample fresh air, without draughts.
(2) The maximum amount of sunlight in the house.
(3) A water-tight roof.

Fresh air without draughts is obtained by making the house with the back and the two sides well closed in, and the front, except for 2 feet from the ground upwards, of wire netting, with a door also in front of wire netting and a wooden framework. There should be no cracks, crevices, nor holes to cause draughts, which are productive of colds, swollen eyes, bronchitis, etc.

The maximum amount of sunlight is obtained by facing the house to the north, but in any case the back should face the prevailing winds and rains; therefore it may be necessary to have the front towards the east or west, and a fair amount of sunlight will penetrate from these directions.

The roof should obviously be water-tight, otherwise water will drip on to the backs of the fowls when roosting, causing a damp floor and a damp atmosphere, all conducive to colds and other diseases and few eggs.

A house with only a small doorway for ingress of fresh air and sunlight is dark, stuffy, a harbourage for vermin and most unhealthy and unprofitable. A so-called roosting house, made of wire netting hung on poles, with a few pieces of galvanised iron on the top, is cold, draughty and again unhealthy, and few or no eggs can be expected from birds so housed.

Provided the three important points mentioned above are adhered to, the material used may be one or other of the following:—Wood, brick, Kimberley brick, pole and dagga, *pisé a terre*, concrete, grass or iron, but in the case of the last mentioned material, the outside (roof, sides and back) should be covered with grass, as the variations in temperature without it are too great, and a purely iron house is too hot in the daytime and too cold at night. In the case of the grass house, this should also be surrounded by wire netting to prevent wild cats and other vermin entering it. The best roof for any house is a good thick thatch, covered with wire netting; a more even temperature is thus obtained, and an occasional spraying with a disinfectant will keep it free from insects. No house should be less than 6 feet deep (*i.e.*, from front to back). A 6 feet square house will hold twenty birds. If over 12 feet wide, the house should be 9 feet deep. The height in front should be 6 feet at least, and 4 feet to 4½ feet behind. The floor should be beaten hard and smooth and kept so, as a dusty loose floor attracts and harbours sand fleas. This floor should be covered to the depth of 1 foot to 1½ feet with litter. The perches should be on one level (not the ladder-like arrangement one so often sees), and running from side to side of the house, and movable; the rear perch at least 1 foot from the back wall, and at least the same space between each; they should be at least 2 inches (3 inches is better) in width—the thin stick arrangement one so often sees is wrong. Under the perches should be a dropping board, and the droppings which have accumulated during the night upon it should be scraped off each morning; this ensures cleanliness, which is one of the most important points in poultry keeping. The nest boxes should be raised 2½ feet from the ground. The house must be comfortable for the fowls and convenient for the owner to attend to them, collect the eggs and clean it easily.

A most important point is absolute security of the birds at night, and to this end there should be no holes by which cats or other vermin can find entrance; a well-made door which can be securely fastened should be a *sine qua non*. Anyone wishing for a practical demonstration of a poultry house as above described should visit the egg laying test now taking place at the agricultural experiment station at Salisbury.

Feeding.—In view of the high price of grains at the present time, the poultry keeper should feed as inexpensively as possible; feeding a variety of foods is not as profitable now (although a few more eggs can be obtained by doing so) as when foodstuffs were cheaper. The following menu is not only productive of good health of the birds, but also ensures a large number of eggs, from birds of course of good laying strains. In the morning six handfuls of munga (inyouti) to every ten birds in the litter on the floor of the house, or in a heap in the run, or half in one and half in the other, followed by green food chopped small and placed in some receptacle out of which the birds cannot scratch it. Such green food may consist of lucerne, lettuces, cabbages, rape, sunflower leaves and leaf stalks, banana leaves, Bougainvillea, Beira creeper, plumbago, Napier fodder, Kikuyu grass, sow thistle, wild spinach, etc., and the birds should have as much as they will eat—they cannot have too much.

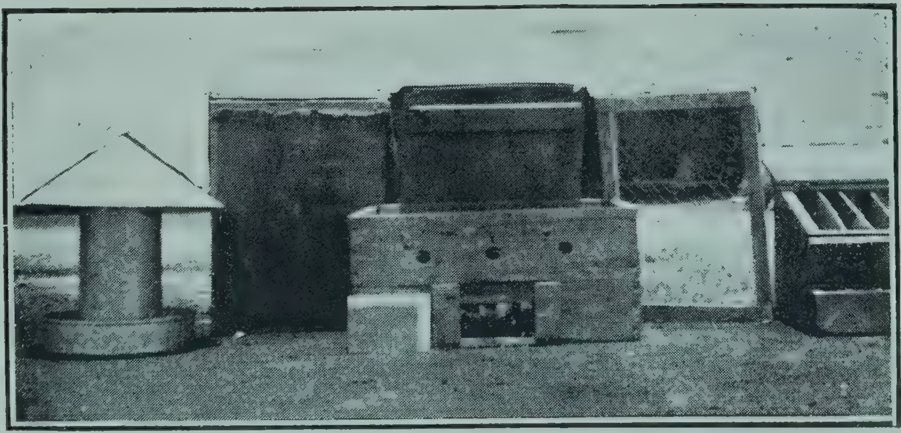
If thick separated milk is available, as much as the birds will drink should be given some time during the morning. At noon they should have four good handfuls to every ten birds of the following mixture dry, and placed in some receptacle:—

Mealie meal, 6 parts;
Bran, 1 part;
Ground nut meal, 1 part;
Fish meal, 2 parts.

If thick separated milk is given to the birds, the fish meal in this mixture can be omitted, but animal protein of some kind they must have to keep in good health and to produce a large number of eggs. Fowls on free range obtain this animal protein in the form of insects.

In the late afternoon about 4.30 p.m. the birds should have grain

Trap nests.



Appliances for feeding dry meal.

again in the litter—in fact a fowl to be in good health should not have a particle of grain but what is scratched for—and the changes can be rung on mealies crushed small, sunflower seeds and munga, followed again by green food as in the morning. The evening meal of grain should be at the rate of eight handfuls to every ten birds. An ample supply of grit, charcoal and either oyster shell, sea shell or well slaked lime should always be in receptacles before the birds; also *clean* water protected from the sun's rays, to every quart of which should be added two teaspoonfuls of Epsom salts one week and the next week the same quantity of Glauber's salts. A little permanganate of potash (sufficient to tinge the water a pale pink colour) once a week is very beneficial. Such should be the treatment of fowls confined in pens if the best results are desired.

FOWLS ON FREE RANGE.

All fowls on farms should be more or less on free range; they require less food given to them and little or no wire netting for runs is necessary, and thus the profits are greater. The housing should be the same as that mentioned above; but the feeding is much more simple; all they require is one meal of grain at 4.30, the same as for those kept in pens; also thick separated milk, for in addition to the insects they obtain on free range, this assists in keeping them in good health and increases the egg output, as also does additional green food.

On all farms there should be thick separated milk available; it should not all be given to the pigs or the boys, for to give it to the fowls is much more profitable. The grit, charcoal and sea shell or slaked lime and clean water should also be given as to fowls in pens. It will thus be seen that the treatment of fowls on a farm is a very simple matter; the main points are cleanliness, proper and comfortable housing and free range to hunt for their food from daylight to 4.30 p.m. The active birds that range well are always the best layers, and often they will come to roost at 4.30 with their crops full, in which case it is necessary to give only one handful of grain to, say, every five birds.

One point is important with fowls running on free range, viz., they are apt to steal their nests. This they will seldom do if the house in which the nests are and the nests themselves are comfortable and clean, and in a fairly dark place; but if some birds persist, when they are commencing to lay, in stealing their nests, put up a small wire run and keep them in this each day till, say, noon, until such time as they lay regularly in the nests.

During wet weather they should be kept in the houses, busy scratching for grain in the litter on the floor. If this was more strictly attended to by poultry keepers during the wet season, we should have no scarcity of eggs, for a wet fowl, especially if she goes to roost with wet feathers and feet, produces few or no eggs.

The illustrations with this article shew appliances (usually termed hoppers) for the feeding of the dry meal to fowls. They are automatic, and can easily be made. Forms of trap nests are also illustrated. For the farmer and small poultry keeper these are not necessary, but for the big breeder and those who sell breeding stock they are.

Is Bee-Keeping Profitable ?

By Rev. Father J. Kendal, S.J.

It is a defensible proposition that the minor industries of a country are the best index of its essential prosperity. It is not the gold-diggers but those who come after them, the people who produce fresh milk and green peas, who are content with small profits and who enjoy the sensation of ownership far more than does the successful speculator—it is these who are the pioneers of plenty.

Though in this unreal world of weddings and funerals the sense of ownership is never completely realised, there is still ample room for joy in the partial possession or leasing of our own soul and of our own cabbage garden, and in the development of both by our own industry. This is the whole gospel preached by the "Journal of Agriculture," which assumes that Rhodesia is a potential garden of Eden, and that the pests and drawbacks which delay our course are only stepping-stones to final victory.

A garden of Eden should flow with milk and honey, and in such a scheme of things the position of bees is obvious. It is true that the sugar cane has supplanted the bee-hive, but sugar, as compared with honey, is wanting in variety and gastronomic character. It bears somewhat the same relation to honey as Cape hermitage does to the real thing. Moreover, the culture of bees is an interesting art—an art of which some persons become passionately fond. A man may be *devoted* to any kind of occupation on account of its mercenary results—bricklaying, for instance, which, in this country, appears to be more lucrative than teaching. But no bricklayer is passionately fond of laying bricks, while teachers are sometimes so passionately fond of teaching their proper charges that their passion overflows and they want to teach everybody.

Bee-keepers, moreover, are, speaking generally, a chivalrous lot, who try to help one another on, in contradistinction to fashionable tailors, who try to cut one another out. Those who persevere and have conquered their early temptations to discouragement, are apt to indulge in proselytism and to allure as many as possible into their own sect. They see on the one hand that all the sweetness of the veld is allowed to evaporate wastefully, while on the other hand, the bees, who are our most industrious agents for development, are left entirely out of hand and are consequently regarded as dangerous pests. Now, bees are meant to be robbed, not murdered, and those who rob them most profitably are their greatest benefactors. They build them comfortable houses and relieve them of all the surplus wealth which they would otherwise uselessly bequeath to their descendants. If hives are set up all over the country, the bees will willingly occupy them and gradually give up their present bad habit of invading premises not intended for their accommodation.

Many young veterans who fought in German East Africa during the late war are able to give thrilling accounts of their painfully interesting experiences with bees while they were on campaign. The Germans contrived to make the bees fight on their side, and, when judiciously stirred up, the insects caused more panic than the machine guns. On the other hand honey was plentiful, and so was beeswax, with which the soldiers made candles by rolling or melting it round old pyjama strings. In fact the natives of those districts, as in many other parts of Africa, are extensive bee-keepers, and though their methods are primitive, they shew what can be done with more modern appliances not only in places where the industry is already established, but in countries, too, like Rhodesia, where the bees and the nectar abound, but where only the bee-keepers need coaxing into existence.

I believe it is maintained by some persons, who have had actual experience in bee-keeping in this country, that the bees of Rhodesia do not store heavily, and that it is consequently difficult for the bee-keeper to secure a big surplus from his hives. In other words, they say that bee-keeping does not pay. My own experience is that a very good average can be obtained in a normal season. I have bought no queens and I have done nothing in the way of queen-rearing—a process which, no doubt, would have done much to improve the quality of my stocks; and yet, in spite of these rather backward methods, I have obtained an average of 85 lbs. per hive in a favourable season. I do not know what happens in Mashonaland. I am speaking of the Bulawayo district, which, I should imagine, is by no means the most favoured region in the country. I cannot help thinking that the failure to secure heavy returns comes from paying too much attention to the production of sections and too little to extracted honey. When the intake of honey is slow and steady, the bees will generally leave sections alone, but will fill completed combs. It is therefore necessary to keep an extractor and to work for extracted honey under ordinary circumstances, but to have the section crates ready for the critical moment when the flow promises to become an overflow. Though the season in this country is a long one as compared, say, with the South of England, the period of rapid flow is usually short. About Bulawayo there is a punctual fortnight in the first half of October when the Tetjani (combretum) is well out and when strong stocks are nearly always ready to fill a box of sections placed over them in the last few days of September. The next heavy flow will depend on the rainfall, and may occur at any time between 15th January and the end of April. In 1913 I had a crate of sections capped, but not well filled, during the first ten days of May. The spring flow, then, is more regular than the summer flow. During the latter there may be a heavy tidal wave of sweetness during which the sections are filled full and rapidly, or there may not. If the season is only middling, bee-keepers who plump for tempting and lucrative section will be disappointed, but those who work with extracted combs will secure a decent output of slung honey. An experienced operator gets to know when the bees really want the sections, and he does not put them on until he sees the signs of unusual activity.

The explanation of the facts just given seems to be, partly at least, in another well-known fact that it requires several pounds of honey to produce one of wax. Bees are economical creatures, and they will not waste their energies on making wax at all unless there is a superabundance of nectar. When there is plenty they seem to enjoy making the wax, and then they make no difficulty about working out the strips of foundation in the sections. But when supplies are short they will often not only not work out the strips, but will actually nibble them away and use the material elsewhere. A crate of sections is like a tyre with a stubborn valve: it requires a heavy flush to fill it.

The following table of results from the writer's apiary at Bulawayo may be of interest. It will be seen that October is the surest month, the crop being then independent of the rainfall. The spring crop starts coming in about 15th September, but the high wave of the inflow is during the first half of October. In the case of the other months, honey entered as having been harvested in one month is likely, most of it, to have been stored by the bees in the month before.

The output is given in pounds per month.

Season	1912-13	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19	1919-20
No. of hives	7	8	14	11	15	16	16	17
October ...	40	37	42	216	248	76	232	263
November ...	35	26			80	65	72	139
December ...		10					23	
January ...		108	25			90	140	
February ...			88		61	40	210	267
March ...	63	97	136		76	368	60	245
April ...	223	89	173	25		181	62	77
May ...	237		284	58		211		
Total ...	598	367	748	299	465	1,031	799	991

Maize Grading.

The general grading of maize for farmers and others was commenced on the 7th July. Last year much of the graders' time was given to grading maize which finally never left the country, and this naturally prolonged the grading season. Growers and purchasers will greatly help the Department of Agriculture and expedite handling if this year they will confine their applications for grading as far as possible to consignments definitely destined for export beyond Rhodesia.

Representations have been made to the Department of Agriculture on behalf of Rhodesian growers that under the grading arrangements hitherto prevailing, there was a tendency to great congestion of maize at railway stations and sidings, owing to the necessity of stacking the bags in such a way as to enable graders to have access to every bag. Such stacking has entailed spreading the bags over a wide area, and since in the majority of cases there are no proper stack floors, considerable loss in grain and bags has resulted.

To endeavour to meet these difficulties, and purely as a tentative measure, liable to cancellation at any time if found impracticable, it has been agreed that in certain cases and subject to certain stipulations grading may be done on the farm instead of at the station or siding. Owing to difficulties of transport, the time required for a grader to get from one farm to another and the necessary limitation in the number of graders employed, it is possible to grade on the farm only a portion of the total amount of maize requiring grading. Grain which has been graded on the farm may be stacked at sidings and stations pending railage in any manner convenient. Ungraded grain awaiting grading either on farms or on the railway must be properly stacked as heretofore, so as to enable the grader to have free access to each bag.

The following conditions apply to grading on farms:—

By arrangements made between the grower and the grader, graders may proceed to a farm and back from the most convenient point on the railway by rapid transport provided by the farmer, and at times and for periods fixed strictly by the grader acting in consultation with the District Traffic Superintendent of Railways, Salisbury. Such visits must in no case interrupt the prompt performance of duties already allotted or movements ordered by the District Traffic Superintendent.

Farm grading is only applicable to farms within ten miles by road of the siding or station to which the maize is to be delivered. The arrangement is only applicable in respect of quantities of 2,000 bags of maize and upwards actually awaiting transport to railhead and destined for export. The arrangements for farm grading are subject to cancellation at any time and the right of refusal of any or all such farm visits is reserved.

A further innovation is the printing on the grading certificate of the following:—"This certificate is liable to cancellation at the discretion of the Director of Agriculture. (This provision is added to safeguard against the export of grain damaged by rain, weevil, white ant, etc., subsequent to the original grading.)"

The necessity for this reservation is obvious. There is always the possibility that owing to early rains or congestion on the railways considerable quantities of maize may be so damaged by wet and weevil as to render re-grading desirable. That such grain should be exported without re-grading would be most injurious to our reputation, and since the primary object of all grading is to establish and maintain the excellent name we have already made for ourselves, it is essential that the Government should be able to re-grade grain if occasion requires. On the other hand re-grading may not be necessary, and to fix an arbitrary date for the expiry of the certificates would only entail repetition of examination and inconvenience to exporters which may be avoided.

A Cheap Irrigation System.

By "Chirupula."

With the arrival of the dry season, when brick-making may be resumed, the following may be of interest to anyone contemplating a cheap and efficacious irrigation system.

To irrigate a citrus orchard, the writer and his brother, with the assistance of a builder's level and staves, kindly loaned by a friend, made a trench between four and five miles in length, and turned the best part of a small river into it. The intake of the trench may be measured in "thousands of gallons per minute," but the delivery is merely "gallons per minute"—the difference being lost in transit. To prevent erosion near the points of delivery, a tiled flume has been constructed, and after a year's trial, is found to be entirely successful, and can be recommended.

Fig. 1 shews the end view of the trench.

Fig. 2 shews a perspective view of one "side" piece "A" in fig. 1.

Fig. 4 shews the shape of one end of the mould in which fig. 2 is moulded. Two such ends are needed, to which at "B" is nailed a piece

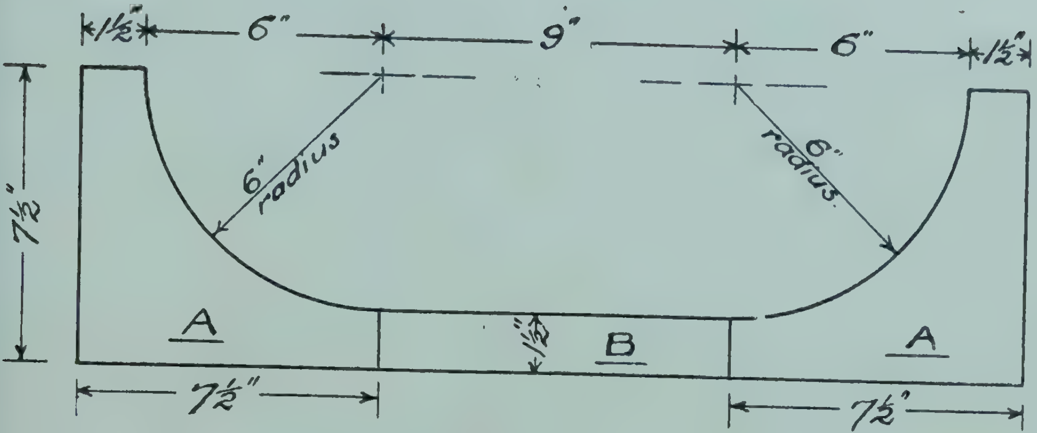


Fig. 1.

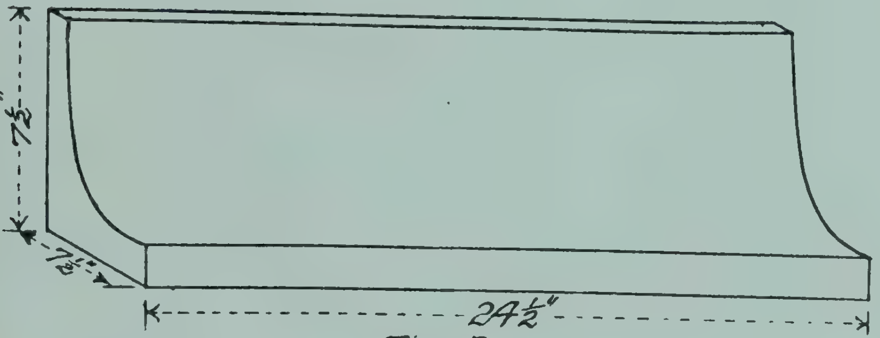


Fig. 2.

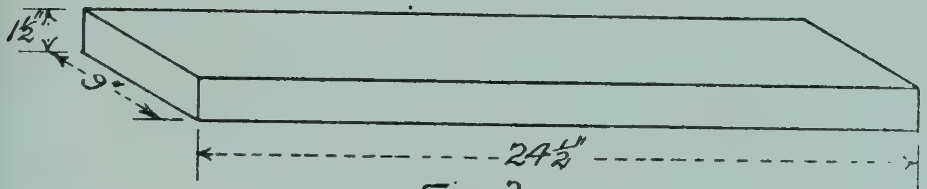


Fig. 3

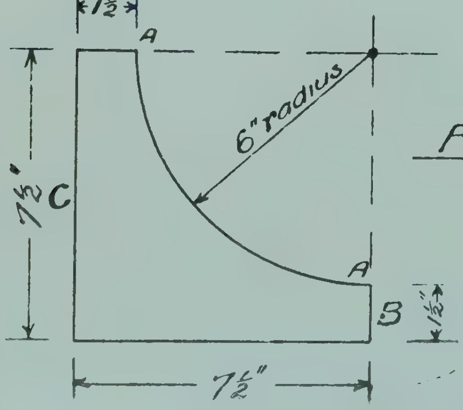


Fig. 4.

of plank 26 in. x 1½ in.; whilst another piece 26 in. x 7½ in. is nailed at "C." (Note.—If the clay is good, longer moulds might be made, but the sizes here given are what the writer found most suitable in his case.) The curve is the quarter of a circle, whose centre is 6 inches from the points "A" "A." The planking may be of ¾ inch thickness, and hoop-iron going over the joints will be strengthening.

Fig. 3 shews in perspective section "B" in fig. 1. There is no need to make a plan of the mould for this "slab," as anyone can design one. It may be stated that with the poor "brick earth" the breakage of these "slabs" is about twice as great as the "sides." But none need be wasted; it means only more joints are to be cemented.

A good straight piece of wood about 6 inches longer than the greatest length of the mould is required. With it the surplus clay protruding from the mould is scraped off, when the mould is carefully lifted up, leaving the soft "side" or "slab" lying on the ground where it dries. The "sides" are placed on their ends, and the "slabs" on their sides, in the kiln, and burnt just like bricks.

It is *important* that the trench should be level, for if dug too deep, and the foundations on which the brickwork is to rest are made up, there are risks of the water getting through the joints and washing out the soft earth, and the brickwork collapsing. In the case of "made up" foundations it is advisable to leave the trench until a shower of rain has soaked the land before running water through.

Joints should be cemented, but clay has been used by the writer.

Further Notes on Dip-Testing.

By A. W. Facer, B.A., Assistant Agricultural Chemist.

As a result of interest aroused by the article entitled "Hints on Dips and Dip-testing" which appeared in the June issue of the ***Journal***, several letters have been received in which enquiries were made upon points which others may desire to be informed of. The replies to these enquiries are embodied in the following notes:—

Apparatus and Booklets.—One correspondent pointed out that his "Champion" apparatus contained an indicator labelled "D," to which no reference was made in the article mentioned; that the alkali was labelled "E," and not "D" as stated in the article; and that his booklet contained no tables which would enable him to find the strength of a dipping fluid in terms of any of the proprietary dips when he had determined the percentage of arsenious oxide by his dip-tester. His difficulties are due to the fact that he is using the first type of dip-testing apparatus produced by the Standard Arsenic Company, which included an indicator in a bottle labelled "D," a few spots of which were added to each dip sample to indicate when it was acid or alkaline. The apparatus has since been simplified somewhat to reduce expense, and as the indicator "D" is not absolutely necessary to the test, it is no longer included in the apparatus, and the bottle containing the "alkali" (sodium bicarbonate) is now labelled "D."

A different booklet of instructions has also been prepared containing tables which enable one to evaluate a dip in terms of dilutions of any of the dips on the Rhodesian market, and it is these tables to which constant reference is made in the article mentioned.

The Standard Arsenic Company, c/o Cotton & Downie, Salisbury, have kindly promised to supply a copy of this booklet gratis to anyone who applies to them and states that he received the first booklet with his apparatus.

The "Settling" of Dirt in Dip Samples. Some enquirers state that they have had samples from which the muck was not precipitated by adding about 20 spots of the acid "A," shaking and allowing to stand. It may be said in passing that it is very unwise to attempt to test a dip without separating nearly all the dirt, for the dark colour of the dirt makes it very difficult to observe the end point; and this may easily lead to serious errors.

From what has been observed in the laboratory it would seem that some samples settle with difficulty because they are excessively dirty, coming from tanks which need cleaning out. Some samples which seemed disinclined to settle after the first addition of acid have settled nicely on adding about 10 spots more of acid, shaking and allowing to stand. It is sometimes found that the addition of a little alum (about half a teaspoon to a quart bottle) assists the deposition of dirt in dip samples. When this method is resorted to an excessive amount of alum should not be used, as it may render the results of the test inaccurate.

Whenever it is found impossible to pour off a clear liquid from a dip sample, the sample should always be filtered.

Need Sample Bottles be Clean?—One enquirer asks whether the result of a test would be affected if the sample bottle contained a trace of milk when the sample was taken. In all cases in which samples are taken for any analysis it is essential that the vessel to contain the sample should be thoroughly cleansed; especially is this the case in volumetric analysis with a solution of so re-active an element as iodine, as in dip analyses. The vessel in which the sample is to be taken should first be cleansed of any foreign matter whatever, and then stood for a while to allow the water to drain out.

The First Egg-Laying Test in Rhodesia.

This test has now been running since 21st April, 1920, and concludes on 2nd March, 1921. Its objects are:—

(1) To stimulate the interest in poultry among all sections of poultry-keepers in Rhodesia.

(2) To prove by practical demonstration the advantages of poultry-keeping in Rhodesia.

(3) To demonstrate to all interested the methods of keeping poultry for profit. All are welcome at any time to visit the site of the test and obtain knowledge of these methods on the spot.

(4) To obtain records, details, etc., of the birds of the country, and encourage poultry-keepers to breed from their best birds.

The advantages of such a test are legion, and it is gratifying to note that a very large amount of interest is being taken in it by the poultry-keepers of the country.

Twenty pens only were available this the first year, and there were thirty-five entries for these. The successful ones were allotted by ballot. Already for the next one, which will commence on 1st April, 1921, approximately 75 poultry-keepers have signified their intention of entering pens, and it is to be hoped that many more pens will be available. It is therefore requested that all poultry-keepers who propose to enter pens in the next competition communicate as soon as possible in writing with the Poultry Expert, Department of Agriculture, Salisbury.

Many of the birds on arrival were in—not poor—but in rather soft, flabby condition. These could not in such a condition have laid their maximum number of eggs, for the strain of laying a large number is great. These birds, as well as all the others, are now in excellent condition, *i.e.*, hard, lean, healthy and vigorous, but such birds did not, until they were brought into this condition, lay the number of eggs they would otherwise have done. Those owners whose birds on arrival were in good condition, and who gradually accustomed them to the food and treatment they are receiving on the test, are doing well; all poultry-keepers who enter birds in future tests are strongly advised to note this.

The birds on the whole are doing remarkably well, and, compared with other tests that are at present being carried out, are more than holding their own.

It will be noted that the test is to be decided on total weight of eggs, and not of number; this is the most satisfacory method, both from the point of view of the competitors themselves and from the food value point of view. For instance, a bird laying 20 eggs of a total weight of

3 lbs. is more valuable than one laying the same number of eggs weighing only 2 lbs. 10 oz. ; she is a producer of a greater amount, and is therefore of more value to the country. We hope to see ere long all eggs sold —as other foods are—by weight, *i.e.*, at a fixed price per lb.

The care, etc., of the birds is carried out in the absence of the Poultry Expert, who is frequently travelling, by a very intelligent Cape boy, who was formerly trained by the Expert, and has an excellent knowledge of the care and treatment, etc., of poultry, and who carries out his work in every detail most satisfactorily. Owners, therefore, need not have the slightest fear that in the absence of the Poultry Expert their birds are not being well cared for, and the test carried out as well as when he is present.

As an instance of the performances of the birds, the records of some for the month of June are as follows:—

Hen No. 11 (pen 3) laid 29 eggs.
Hens Nos. 55 (pen 11) and 96 (pen 20) each laid 27 eggs.
Hens Nos. 2 (pen 1), 12 (pen 3) and 74 (pen 15) each laid 26 eggs.
Hens Nos. 5 (pen 1), 14 (pen 3), 52 (pen 11), 63 (pen 13) and 100 (pen 20) each laid 25 eggs.
Hens Nos. 4 (pen 1), 53 (pen 11), 76 (pen 15) and 94 (pen 19) each laid 24 eggs.

Also during the week ending 6th July the average number of eggs laid per day was 63.4. There were 92 birds laying during this week, eight being still in a moult into which they fell shortly after their arrival, due to the change of quarters, surroundings and sudden change of treatment and feeding.

During the week ending 6th July—

Six hens each laid 7 eggs.
Eighteen hens each laid 6 eggs.
Thirty-seven hens each laid 5 eggs.
Fifteen hens each laid 4 eggs.

If the birds continue to the end of the test as they are doing at present, a number will make excellent individual records, and the total record will be one of which Rhodesia can be proud. In this connection it should be remembered that this is the first test ever carried out in the country, that the fowls taking part in it are principally from farms and small poultry-keepers, and that the Rhodesian poultry industry is one of the youngest in the world.

THE FIRST SOUTHERN RHODESIA EGG-LAYING TEST.

21st April, 1920, to 2nd March, 1921.—Five Birds in each Pen.

Pen.	Position.	Owner.	Residence.	Breed.	21st April to 20th July, inclusive (13 weeks).			
					Total No. of eggs.		Total weight of eggs.	
					Above 2 ozs.	Below 2 ozs.	Above 2 ozs.	Below 2 ozs.
1	2	H. Tatham	Penhalonga	White Leghorns	315	8	41 lbs. $8\frac{13}{16}$ ozs.	$13\frac{15}{16}$ ozs.
2	12	Mrs. Walleen	Bembesi	do.	227	11	29 lbs. $4\frac{12}{16}$ ozs.	1 lb. $3\frac{9}{16}$ ozs.
3	1	A. Hampson	Umtali	do.	334	7	45 lbs. 9 ozs.	$13\frac{5}{16}$ ozs.
4	20	Mrs. Renton	Que Que	do.	109	...	14 lbs. $5\frac{5}{16}$ ozs.	...
5	11	A. R. Low	Gwelo	do.	225	6	30 lbs. $1\frac{3}{16}$ ozs.	$11\frac{8}{16}$ ozs.
6	14	W. Bands	Salisbury	Anconas	212	6	26 lbs. $13\frac{14}{16}$ ozs.	$11\frac{2}{16}$ ozs.
7	19	Mrs. Lloyd	Inyazura	White Leghorns	143	5	19 lbs. $13\frac{2}{16}$ ozs.	$8\frac{14}{16}$ ozs.
8	18	W. F. Williams	Bulawayo	do.	167	53	20 lbs. $7\frac{11}{16}$ ozs.	5 lbs. $11\frac{1}{16}$ ozs.
9	17	Mrs. Kimpton	Umtali	do.	191	25	24 lbs. $1\frac{11}{16}$ ozs.	2 lbs. 9 ozs.
10	5	Mrs. Gibbings	Avondale	do.	265	1	37 lbs. $13\frac{1}{16}$ ozs.	$1\frac{4}{16}$ ozs.
11	15	H. Fretwell	do.	Rhode Island Reds	201	8	26 lbs. $4\frac{8}{16}$ ozs.	$15\frac{3}{16}$ ozs.
12	4	T. Brokensha	Umtali	White Leghorns	293	3	40 lbs. $12\frac{10}{16}$ ozs.	$5\frac{8}{16}$ ozs.
13	8	C. L. Brown	Salisbury	do.	255	4	33 lbs. $14\frac{11}{16}$ ozs.	$7\frac{3}{16}$ ozs.
14	9	J. S. Wreford	Bulawayo	do.	219	...	31 lbs. $4\frac{9}{16}$ ozs.	...
15	13	D. O'Linn	Salisbury	do.	213	7	28 lbs. $0\frac{3}{16}$ ozs.	$13\frac{4}{16}$ ozs.
16	3	A. E. Speight	do.	do.	316	6	41 lbs. $4\frac{9}{16}$ ozs.	$11\frac{10}{16}$ ozs.
17	16	Mrs. Williamson	Banket	do.	197	28	24 lbs. $10\frac{9}{16}$ ozs.	3 lbs. $2\frac{11}{16}$ ozs.
18	6	Bray & Bull	Umtali	do.	291	10	36 lbs. $14\frac{14}{16}$ ozs.	$15\frac{13}{16}$ ozs.
19	10	Miss Greig	Bulawayo	do.	222	2	30 lbs. $2\frac{15}{16}$ ozs.	$3\frac{14}{16}$ ozs.
20	7	Mrs. Deall	Old Umtali	do.	290	49	34 lbs. $6\frac{12}{16}$ ozs.	5 lbs. $8\frac{2}{16}$ ozs.
				Totals	4,685	239	617 lbs. $13\frac{6}{16}$ ozs.	27 lbs. $0\frac{14}{16}$ ozs.

Witwatersrand Agricultural Society.

RAND SPRING SHOW OF FAT STOCK, SHEEP AND MAIZE AND SALE OF BREEDING STOCK.

The Fifth Annual Spring Show of the Witwatersrand Agricultural Society takes place this year on Wednesday and Thursday, the 8th and 9th September, and will be held at the Society's Show Grounds, Milner Park, Johannesburg.

The programme for the forthcoming show follows substantially that of last year, with the addition thereto of a comprehensive section for pure-bred sheep, for which alone cash prizes and cups and medals amounting to over £1,300 are offered.

Fat Cattle.—In this section 24 classes are this year provided, as against 20 last year, and for which the Rand Society are offering in prizes a total of over £1,150. In the ordinary single and group classes the premiums are £20 firsts, £10 seconds and £5 thirds; whilst in the two principal group classes, *i.e.*, one for five oxen under three years and the other for five oxen any age, the prizes are £100 firsts, £50 seconds and £25 thirds. In the group for five baby beefers, *i.e.*, animals under two years, three prizes of £50, £20 and £10 are offered.

Amongst the new classes provided this year is one for "Best Group of 50 Veld Fed Oxen," for which a special cash prize of £50 is offered.

Following the practice of past years, the championships will again be decided under block test conditions, which, *inter alia*, provide that special consideration will be given for quality, weight for age and distribution of meat. The prize money offered in each of the two championships is £50, and for all animals slaughtered under the block test the Society guarantees to exhibitors a minimum price of 55s. per 100 lbs. dressed meat.

In addition to the foregoing, sundry special prizes are also offered for competition in the slaughter classes by Breed Societies and others, including one of £100 (£50 first, £30 second and £20 third), presented by the Aberdeen Angus Cattle Breeders' Society of South Africa, for a group of five Aberdeen Angus oxen; one of £25 presented by the Henderson Consolidated Corporation, Ltd., for the best pair of Shorthorn oxen with not more than six teeth, and another of £15 15s. for the best pair of Hereford steers under four years, presented by the Hereford Breeders' Society of South Africa, whilst a special prize of £10, presented by Mr. W. Drysdale, Mooi River, is offered to the stockman in charge of the winning group of Aberdeen Angus oxen. The Society's gold medal is also offered for the live (hoof) champion slaughter animal on the show.

At previous shows all the cattle classes were practically confined to "bred by exhibitor," but at the forthcoming show all competitions, with a single exception in the special prize classes, will be "open."

With regard to the weight for export animals, it is being made a condition of judging that the minimum of a carcase be 600 lbs. and the maximum 825 lbs.

Slaughter Pigs.—Classes are provided for each of three porkers, three bacon pigs and three sausage pigs (200 lbs. and over), with prize money in each of £10, £5 and £2 10s., whilst a new class is this year being provided for the best exhibit of 25 bacon pigs, for which a single prize of £50 is offered.

Maize Section.—In this section provision is made for 81 classes, with a total prize money of £639 5s., as follows:—

	Classes Provided.	Prize Moneys.
Shelled maize (10 bags and 10 ears)	6	£105 0 0
Breeding ears, 500	4	210 0 0
Breeding ears, 200	8	140 0 0
Breeding ears, 10	31	99 15 0
Breeding ears, 1	27	45 10 0
Juvenile Competition	8	39 0 0
Total	84	£639 5 0

In the shelled maize and 200 ear classes the prizes offered in each class are £10 first, £5 second and £2 10s. third, and in the 500 breeding ears, £30 firsts, £15 seconds and £7 10s. thirds.

The Society also offers three championship silver medals in each of the commercial and 500 ear sections, and two championship silver medals in each of the 200, 10 and single ear sections, together with gold medals for the grand championships in each of the five sections abovementioned.

In addition to the foregoing, two silver challenge cups have been presented for competition at the Society's annual Maize shows—the one, valued £50, by Mr. Sam Mottram, Potchefstroom, for the grand champion 500 breeding ears on the show, and the other, valued £25, by Mr. T. Kleinenberg, Pietersburg, for the grand champion 200 breeding ears on the show, whilst a special prize is also offered for the district winning the most prizes in the maize section.

An exhibitor in the maize section may make two entries in any class, but can only be awarded one prize, and in the commercial classes exhibitors are this year permitted to place a sale reserve on their exhibits.

Provision is again made in the prize list for a juvenile competition, open to lads not over 18 years, and for which a substantial money prize is offered, including two championship prizes, one of £5 and the Society's silver medal for the best ten ears, and the other of £2 10s. and silver medal for the best single ear.

Breeding Stock Sales.—During the forthcoming show period the Society will hold their fifth annual sale of breeding stock, and, follow ing the practice of last year, entries will again be accepted for high class non-registered bulls and heifers suitable for ranching purposes, in addition to registered pedigree animals. As an incentive to breeders, the Society has this year decided to promote competitions for all animals entered for sale, and are offering the sum of £100 in prize money, as follows:—

1. For the best registered bull on the show suitable for ranching	£50
2. For the best unregistered bull on the show suitable for ranching	30
3. For the best bull on the show, any breed, open	10
4. For the best cow or heifer on the show, any breed, open	10

Messrs. John Roderick & Co., Bloemfontein, have been appointed the Society's official auctioneers for the conduct of all the sales during the forthcoming show period, and entries for the sales section, *which close on the 31st July*, may be made direct to them or to the Society's Secretary.

Entries for the fat stock, pure-bred sheep and maize sections close on the 15th August.

Prize lists, in English and Dutch, and entry forms, together with all further particulars, may be had on application to the Secretary of the Society, P.O. Box 4344, Johannesburg.

Review.

THE KALAHARI; OR THIRSTLAND REDEMPTION.

This work, by Professor E. H. L. Schwarz and published by T. Maskew Miller, Capetown (6s. 6d. net and post free), will attract a wide circle of readers, particularly farmers, in Rhodesia. For some time past we have all been interested in this subject, and now we find the case ably and comprehensively presented in book form, with the fullest available information on the subject set forth coherently and convincingly, and at the same time in such simple language as to be readily grasped by the layman. The subject is of course highly controversial, and in a very proper scientific spirit the book sets out only as a plea for consideration of the problem and determination by fuller enquiry whether or no it is feasible to divert some of the surplus waters of the Cunene River and tributaries of the Zambesi so as to refill the ancient lake beds and water courses of the Kalahari. Very strong *prima facie* evidence is presented, and it would seem a thousand pities if the Governments concerned cannot at the least cause a comprehensive survey to be carried out, and perhaps even experimental steps initiated to see how far the theory can be proved. The potential benefits are certainly so great as to warrant thorough investigation before the suggestion is turned down, especially in view of the plausible arguments now adduced.

Professor Schwarz, who was formerly geologist in the Cape Government service and now occupies the chair of geology of the Rhodes University College, Grahamstown, first sets out in this work to shew the steady increase of droughts throughout South Africa during the past century, and concurrently with the deviation of the water supply from the Ngami and Makarikari Lakes into the Atlantic and Pacific Oceans. By reference to actual historic facts it is shewn that gradually the recurrence of droughts has become more severe and more frequent; that "in the last twenty-two years, as compared to the previous twenty-two years, the droughts have doubled, and the normal years been reduced by half, and there are only two good years as compared with six." This is shewn as follows:—

1874-1896: 7 good years, 8 normal years, 8 droughts.
1897-1919: 2 good years, 4 normal years, 17 droughts.

That there is an enormous extent of arid land to the south of us we know, but it will come as a surprise to most Rhodesians to learn that, whereas in this country of some 148,500 square miles in extent we have no such territory, the extent of country in which there is a deficiency of moisture is as under:—

Cape Province	27,151	square miles.
S.W. Protectorate	322,450	,,
Bechuanaland	386,200	,,
Orange River Province	49,950	,,
Transvaal	56,821	,,

Against these arid areas it is interesting to learn that the extent of our lost lakes of South Africa—the Greater Ngami, the Makarikari and the Etosa Pan—is some 50,000 square miles, or practically the same size as the three largest existing lakes of Central Africa, viz., Victoria Nyanza, Tanganyika and Nyasa, which play such an important role in rendering fertile, humid and habitable the tropical portion of this continent, and which but for their existence would be as the Sahara is to-day.

That little amelioration is to be looked for from existing or prospective irrigation works is shewn by the following extract:—"The irrigated land in the Union is about 600,000 acres, and the present works, when completed, will add some 150,000 acres to this total; the whole area is well under one million acres, or less than one-seven-hundredth of the total area over which there is a deficiency of moisture, and which is hungering for what little moisture is available. No amount of irrigation and impounding of water on the ordinary scale will have an appreciable influence on the climate of South Africa."

It is not suggested, as is sometimes erroneously asserted by critics of these proposals, that the re-establishment of these inland seas in South Africa would of itself supply sufficient moisture by evaporation to counteract our droughts. The theory propounded, and it certainly seems feasible, is that, as we all know from common observation, from the ocean "the winds blow moisture inland, most of it is precipitated on the coast ranges, but a remnant accumulates in the interior till the air at certain seasons becomes nearly saturated," and it is obvious that only a slight addition is necessary to secure frequent precipitation. We are all familiar with the spells of dull cloudy weather we experience when it so nearly comes to rain but fails to do so, and how in the hot days of early summer it "works up to rain," as we say, and then "goes off again." If such spells could be converted into actual rains, what a benefit it would be to the country! Even the possibility of such an improvement deserves scrutiny.

Professor Schwarz estimates that "quite half our rain clouds drift away and carry their moisture out of the country because of want of a small additional humidity." On one detail, however, which he uses in his argument, we venture to challenge the opinion of the writer, who describes the mopani as obnoxious and always an indication of want of water. Neither assertion is in accordance with our experience of this valuable timber, which often grows on land otherwise of little use and on ground which, however dry it may be in the winter, is too waterlogged in the rainy season to be fit for cultivation or for stock. It is true the mopani is tolerant of adverse conditions, but it certainly is not indicative of dry climates.

Briefly, it may be said that Professor Schwarz claims that by comparatively low weirs at selected points rivers may be made to flow south instead of east and west uselessly, and to return to courses which by accident they have left, and whereby they will greatly benefit a large portion of this sub-continent.

For full argument and for details of Professor Schwarz's ingenious project we refer our readers to the absorbingly interesting pages of this book, in which the facts are marshalled with deep conviction and in most attractive form. One cannot but be impressed, if not convinced, by the argument, and it is sincerely to be hoped that the fullest possible enquiry will be made into this most alluring problem.

As regards the waters of the Zambesi River itself we may again quote the author in order to indicate the actual position (page 103):— "The area in which the diversion of the rivers is proposed lies between the Victoria Falls and the Great Falls on the Cunene. I should have liked to include the Zambesi River with the others, but I have been advised that no meddling with the Victoria Falls would be allowed; in the first place, it is one of the wonders of the world, and in its sublimity has captured the imagination of countless thousands of people who would raise an outcry if the waters were turned into their old channels southwards, and the Batoka Gorge were to become a dry canyon like the Magwa Cleft in Pondoland. In the second place, the Victoria Falls Power Company has acquired rights over the water, and there would be trouble in acquiring them back for the good of the nation. I have therefore worked out my scheme without touching the Zambesi."

E. A. N.

Correspondence:

EARLY MATURITY IN CATTLE.

Sir,

The statement made by Mr. Gwynn at the annual meeting of the Devon Breeders' Society and reported by you in the last issue of the *Agricultural Journal* as follows: "That after many years' experience he was of opinion that the Devon not only held its own, but matured a year earlier than heavier breeds," cannot be allowed to go forth unchallenged.

As a Shorthorn breeder I should like to reply to above statement, and I trust the champions of other breeds will do likewise.

First of all one expects such a sweeping assertion to be backed by records of the breed's achievements in this direction, either in show ring or at fat stock shows in Great Britain or South Africa.

I take it Mr. Gwynn was alluding to steers and not heifers when he made the above statement, as it is inconceivable such a good cattle man would seriously put forth the statement that Devon females matured a year earlier than other breeds, otherwise we should have Devons calving down at anything from a year to two years of age.

It will be interesting and probably informative to examine the records of fat stock shows in England, "the home of Devon." Take the leading fat stock show in Great Britain, *i.e.*, Smithfield. The records from 1869 to 1916 are as follows:—

First and champion beast on show, Shorthorn 20 times.
,, ,, ,, Aberdeen Angus 16 times.
,, ,, ,, Cross-bred 5 times.
,, ,, ,, Hereford 3 times.
,, ,, ,, Devon 3 times.

Surely above records, *where early maturity is first consideration*, do not bear out Mr. Gwynn's statement. Last year the results of the two leading fat stock shows in England, viz., Smithfield and Birmingham, were as follows:—First and champion, first reserve, Aberdeen Angus and Shorthorn cross; second reserve, Shorthorn. Birmingham results were: Champion, Shorthorn; first reserve, Aberdeen Angus and Shorthorn cross. Such is the result in Great Britain.

Now let us turn our attention to South African results. After long experience I cannot recollect ever having seen a pen of Devon steers or even a single steer being placed first at any of our leading fat stock shows, either in the Union or Rhodesia. We will take last year's results. At Salisbury the champion pen of oxen on the show were Shorthorns. The Bulawayo champion pen were again Shorthorns, second Herefords, third and fourth Lincolns. The Johannesburg champion pen were Herefords, second Shorthorns, third Lincoln Red Shorthorns.

The champion bullock in the block test, Shorthorn. Again at Bulawayo Show this year both first and second prizes for the best pen of ten ranching steers went to Shorthorns. Surely this evidence proves that at any rate the Shorthorn can hold its own. Anyone visiting the last Bulawayo Show had a splendid opportunity of noting and comparing the maturing qualities of Devons when in competition with heavier breeds. We had there Shorthorn, Hereford and Devon bulls each eleven months old, and I state without fear of contradiction that both the Shorthorn and Hereford would scale (live weight) from 150 to 200 lbs. more than the Devon. So much for early maturity. After all these sires are to be the founders of our future herds, and if Mr. Gwynn's statement is the means of making cattle owners and breeders pay more attention to different breeds at different ages, then perhaps it may do some good.

We all admire enthusiasm in anyone championing their own particular breed, but to boost a breed at the expense of other breeds, without producing any evidence whatsoever, is apt to be misleading. All breeds are good, but naturally as a Shorthorn man I think the red, white and roan supreme among bovines.

Finally, for the last six consecutive years at the Bulawayo Show a Shorthorn bull has been the supreme champion for the thousand guinea trophy. For the last four years at Salisbury a Shorthorn has also been supreme champion, and at the last show sale of commercial stock at Bulawayo the following prices for slaughter stock were realised :—

Shorthorns (2 pens)	£16	15	0
Shorthorns (2 pens)	16	10	0
Herefords (1 pen)	14	5	0
Devons (1 pen)	11	12	6

It is from the above facts, verified year after year in every cattle country in the world, that the Shorthorn has become what he is to-day, viz., more numerous than all other breeds added together, and with a record for quality and early maturity second to none.

Yours, etc.,

J. DALTON.

The Agricultural Outlook.

Farmers are busily engaged in shelling their maize, which is cropping heavier than was expected. The grain this year has plenty of weight, and there should be little difficulty in filling the bag. Owing to the late rains the tips of the cobs in some crops were damaged, and it is not likely that there will be as big a proportion of No. 1 grade as last year. An increasing number of farmers are practising seed selection, but considering we require about 13,000 bags of seed maize for local use, there is plenty of scope in this direction. Rotation is taking a more prominent place in farming practice, the necessity in some instances being demonstrated by seriously decreasing yields. Green manuring is also more frequently met with, and excellent results are reported of the effect of ploughing under velvet beans. In this connection we would draw the attention of farmers to the value of sunn hemp for a similar purpose. The cutting of more hay and therefore the accumulation of more manure in the manner described by Mr. Blackshaw in his article in this issue is a practice we hope to see more universally adopted.

The severe frosts experienced this year have caused the veld to dry out more rapidly than was anticipated, but so far grazing conditions are normal. Grass fires have caused damage in certain parts of the Territory, particularly at Gwelo, where a large area was burnt out, but the evil has not been so much in evidence as last year. Farmers are realising that the remedy is largely in their own hands, and are taking active measures to combat the danger.

The capacity of the Tobacco Warehouse is being taxed to its utmost to deal with the crop now coming in, and it would appear necessary, in view of the expansion of the industry which may be expected next season, to increase the accommodation, unless a large number of growers grade their leaf on the farm. Very few farmers graded their own tobacco this season, but the possibility of this should be taken into the calculation of prospective growers.

Cattle are naturally falling off in condition, but there should be sufficient grazing to carry them through until the rains arrive. There was a fresh outbreak of African Coast Fever at No. 1 Sauerdale during June, two cases being diagnosed, otherwise the situation is satisfactory and the disease is not spreading. Quarter-evil has been extending in several districts east of Salisbury and in the Makoni district. This has been a particularly bad year for horse-sickness, an unusual feature being the continuation of mortality until late June.

Prices for the earlier consignments of citrus fruits exported overseas from Rhodesia were good, over 40s. per case being realised for some of the fruit. The cost of placing a box of fruit on the London market from Rhodesia to-day is about 8s. 6d., so it will be realised that these prices give a handsome profit. It is expected that about 10,000 cases will be exported this year.

There appears to be some improvement in the supply of native labour, although in some districts there is a shortage. The native crops have yielded good harvests, and a large surplus is expected to be available for sale.

Veterinary Report.

April, 1920.

AFRICAN COAST FEVER.

Gwelo District.—At the Hunter's Road centre of infection the mortality was six head.

Mazoe District.—At the Virginia and Rocky Spruit infected centres the mortality was five head.

Matobo District.—No fresh outbreaks. Mortality, 77 head.

Melsetter District.—At the Tarka centre of infection the mortality was 43 head.

QUARTER-EVIL.

A considerable mortality occurred in various districts throughout the Territory.

TUBERCULOSIS.

Five head of cattle which had been in contact with the tuberculous bull reported in March were tested with tuberculin. One re-acted and was destroyed.

HORSE-SICKNESS.

Fatal cases of the disease reported from practically every district.

TRYPANOSOMIASIS.

The Cattle Inspector, Nyamandhlovu, reports that during the quarter ending 30th April upwards of 100 head of cattle died on the Gwaai River from trypanosomiasis.

EPHEMERAL FEVER (Three-days' Sickness).

This disease was prevalent in various districts. No mortality.

CONTAGIOUS ABORTION IN CATTLE.

Several outbreaks reported.

IMPORTATIONS.

From the United Kingdom:—Bulls, 32; heifers, 27. From the Union of South Africa:—Heifers, 45; horses, 62; mules, 70; sheep and goats, 1,334.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 1,882; *via* Liebig's Drift, 262; breeding cattle *via* Liebig's Drift, 929; sheep and goats, 235; horses, 2. To Northern Rhodesia:—Goats, 75. To Belgian Congo:—Sheep, 100. To Portuguese East Africa:—Slaughter cattle, 212; bulls, 8; cows and heifers, 183; calf, 1; mule, 1; donkeys, 2; pig, 1; goats, 29.

May, 1920.

AFRICAN COAST FEVER.

Gwelo District.—At the Hunter's Road centre of infection the mortality was five head.

Mazoe District.—At Rocky Spruit the mortality was five head.

Matobo District.—No fresh centres of infection; mortality 66 head.

Melsetter District.—At the Tarka centre of infection the mortality was 78 head.

QUARTER-EVIL.

Considerable mortality has been reported and the disease is still spreading.

TUBERCULOSIS.

Owing to an animal in a herd re-acting to the tuberculin test in April, the remaining 34 animals were tested, with negative results.

HORSE-SICKNESS.

Numerous deaths reported from nearly all districts.

CONTAGIOUS ABORTION.

One outbreak reported.

IMPORTATIONS.

From the Union of South Africa:—Heifers, 24; bulls, 54; horses, 374; mules, 91; donkeys, 143; sheep and goats, 1,710.

EXPORTATIONS.

To the Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 1,628; *via* Liebig's Drift, 823; sheep and goats, 403; pigs, 87. To Northern Rhodesia:—Donkeys, 12; horses, 15; mules, goats and sheep, 70. To Portuguese East Africa:—Breeding stock, 408; slaughter cattle, 26; donkeys, 37; sheep, 75.

C. R. EDMONDS,
Acting Chief Veterinary Surgeon.

Farming Calendar.

August.

BEE KEEPING.

Now that warmer weather prevails, hives can be opened with safety and examined. Do this when the sun is shining and without exposing the bees too long. The queens are now laying, and, should there be a scarcity of food, feed the bees with syrup inside the hive. Where a hive carries a fair supply of honey, queens can also be encouraged to produce eggs by crushing with a knife blade the cappings of sealed honey still remaining in brood combs. This month and next bees will be collecting nectar and pollen from fruit and bush bloom. Where strong south-easterly winds prevail, hive entrances should be shielded. This will afford bees great assistance in their going out and coming in.

CITRUS FRUITS.

Orange trees should already have been pruned, and should now be ready for the first irrigation. The first growth should be commencing early in the month, and by this time the trees should already have had one good soaking. As soon as the trees have set their fruit they should never be allowed to stop growing through lack of moisture, otherwise the fruit is liable to be poor in quantity and lacking in quality. After irrigation, cultivation should follow, and the earth round the trees be loosened with a spade. If fertiliser is to be used, it should be applied after the first irrigation, so as to be thoroughly incorporated with the soil in the cultivation following.

CROPS.

Provided there are no heavy frosts, dhal may be allowed to remain until August before harvesting. As a second or third year crop, dhal can always be cut earlier, say towards the end of June or in July. Castor beans should be harvested as the pods ripen, which they continue to do for a considerable period. Ploughing should be undertaken continuously wherever possible; the value of early ploughing cannot be over-estimated. Ploughing should be followed as soon as possible by harrowing. Mangels can be pulled and fed as required. The ensilage pit can now be opened, and the contents fed. Seed potatoes should be worked over, and decayed tubers removed.

Crops under irrigation will require but little attention. In oat crops, where the seed has been obtained from the Union, care should be taken to weed out any Drabak or Darnel (*Lolium temulentum*) that may be growing among the crop, as the presence of this weed is injurious. Care should also be taken not to over-irrigate any of the lands.

ENTOMOLOGICAL.

Potato.—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with an arsenical wash.

Cabbage Family.—Young plants of this family should be kept sprayed with an arsenical wash to check attack by webworm. Do not spray plants of which the foliage is to be eaten within three weeks of use.

Onion.—May still be troubled with thrip. Use tobacco wash or paraffin emulsion.

Deciduous Fruits.—Any trees infested with scale may be sprayed with a winter wash during August. Lime sulphur salt wash or scaleside is recommended.

Guava.—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

FLOWER GARDEN.

This is a busy month, and the soil should be kept in good tilth. Roses, shrubs and ornamental trees may be planted. All seeds may now be sown. Marguerite carnations sown now will flower by the end of the year. Cuttings of carnations and other perennials should be planted either in the open ground or in boxes, using loose and well-decomposed soil for the latter, taking care that they are well drained, or the success will be small.

FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they shew a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and gum seeds sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

GENERAL.

Fireguards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

POULTRY.

By the end of this month all those who are not able to give very much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care to make war on insects should keep the chicks in the shade, and watch them carefully. They can continue hatching for another month, but not later, for if they do, the result will be slow growth and weediness in the young stock, deferred maturity and fewer eggs later. Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (often erroneously called tampans) will be found the most troublesome. Fowl ticks were fully dealt with in the *Journal* for February, and a bulletin of this article can be obtained upon application to the editor.

Sand fleas, as most poultry keepers know, are found on the face, wattles, ear lobes and combs. Application of any grease will kill them, as they breathe through pores in the skin; if these are stopped up, the insect is suffocated. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly indeed) is in the dust of the floor of the house and that of the run. Therefore the floor should be hard and smooth. The latter should be treated every week in one of the following ways:—

(1) thorough soaking with a solution of a teacupful of Kerol or Jeyes' Fluid, etc., to a paraffin tin of water;
(2) a strong solution of salt and water;
(3) dusting over and raking into the soil a mixture of 1 part of flowers of sulphur and 2 parts of finely powdered lime.

Unless this treatment is carried out, constant trouble will be caused by these insects, which tend to stop the growth of chicks and young birds and lessen the output of eggs from the adult birds.

STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On diorite farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. The bulls may again be put back into the herds. Any very young calves should be kept near home, and dipping should be carefully attended to. In dairy herds on any soil whatever, feeding, housing and bedding cannot be relaxed. Cows in full milk will benefit by a ration of, say, 5 lbs. of maize (crushed and soaked), 30 lbs. to 40 lbs. of ensilage or pumpkin and 8 or 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of peanuts, crushed with the shell, or linseed ground with maize, or peanut cake, a very great benefit will be derived. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. It will pay to feed to them a little sweet hay, bean meal, linseed, peanuts or peanut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year, but on very dry veld a handful of mealies and a little hay or ensilage will materially assist ewes with young lambs.

VEGETABLE GARDEN.

All vegetable seeds may now be planted. Those having but a limited supply of water would be wise to sow in boxes, transplanting when large enough. The seed beds require careful preparation; they should be well raked up and laid out in long narrow rows in order to facilitate watering. The tops of the beds should be levelled as near as possible, and when sown, covered over with a thin layer of straw or grass, which will prevent the seeds being washed out when watering and the soil from caking.

VETERINARY.

Redwater and gallsickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

WEATHER.

No rain is to be expected, and even on our eastern mountains the precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but the nights are apt to be cold, and grazing being scarce, food and shelter are necessary for the stock.

September.

BEE KEEPING.

In sheltered localities many trees in the bush will now be in bloom. Should there be indications of swarming, put on a crate of sections or shallow frames, correctly fitted with super-foundation. Where a swarm has been secured, place it in a modern hive, and from an established stock remove a frame of comb containing unsealed brood and honey, shake off the adhering bees on to their own alighting board, then insert this comb into the centre of the newly hived swarm. This plan compels the bees to start work at once. As a means of preventing the escape of the queen, a narrow strip of excluder zinc may be fastened at the entrance. This should be removed after about two weeks.

CITRUS FRUITS.

If the trees were irrigated early in August, the next application of water should be given about the first or second week of this month. After irrigation, cultivation should follow. Constant attention should be given to young trees, and a watch kept for any adventitious shoots or suckers, which should be cut away at once. This should be attended to right through the growing season.

CROPS.—See August.

ENTOMOLOGICAL.

Tobacco.—Young plants in seed beds may suffer from cutworms. See Bulletin No. 347.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond back moth and webworm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus Trees.—Scale insects commence to increase rapidly with the advent of warmer weather, but the trees should not be sprayed or fumigated while in blossom.

FLOWER GARDEN.

Although our spring advances with this month, rains are very uncertain and usually scarce, but in spite of circumstances plants now grow with very little encouragement. Perennials and shrubs should be well attended to, especially those which flower early; the soil should be kept well stirred around the stems, and they should be watered if necessary.

Practically all flower seeds may now be sown in boxes, nursery beds, or in the open ground where they are to be grown. Nursery beds are perhaps preferable, as a great deal of watering may have to be resorted to on account of late rains. All annuals sown in July should now be ready for transplanting; should these be few, and a larger show of flowers desired, the heads may be pinched out after planting, which makes the plant spread out more and become bushy. Shrub and ornamental tree seeds should be sown now if desired for planting out during the rainy season, and may be sown in the open; if it is desired to hasten them they should be planted in boxes and covered with glass, and placed in a sunny position sheltered from the winds. If summer bulbs have not already been re-planted, this should be done at once; they sprout as the weather becomes warmer, and, if allowed to do this before planting, the bulb loses much of its vigour. It must be borne in mind that all bulbs that cluster, if divided, produce better blooms, and the plants have a better appearance than the old cluster, which has a lot of decayed matter and generally a ragged appearance; this also applies to those perennials which may be increased by division of roots.

FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. All gum seeds should be planted now if it is intended to grow the transplants in tins. If they are to be grown in beds only, don't plant gum seeds until next month. The seed beds may with advantage be prepared now and watered to make the weed seeds germinate, so that they may be destroyed before planting next month

GENERAL.

Indigenous labour is apt to become more scarce at this time of the year. the boys returning to their kraals to break up the land for next season: Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing

POULTRY.

During the dry weather the supply of such green food as lettuces, cabbages, etc., becomes less, but there are many others which may take their place. For instance, the three following:—Bilhambra, plumbago and wild cockscomb, which are even better than lucerne. Other good green foods are Beira creeper, potato creeper, bougainvillea and Napier fodder. All green foods given to the birds—and they cannot possibly be given too much, for they greatly increase the egg production, and tend also to increase the size of the egg—should be chopped small and put in dishes or troughs. The method so often adopted of throwing it down whole to the birds cannot be too severely condemned; it becomes dirty and withered, and much of it is therefore left by the fowls. Many of the young cockerels should be now fit for killing. Keep the best and get rid of the remainder, for to keep the poor ones means only so much waste of food and labour. They will never be profitable or fetch more than killing price. While on this subject of dispensing with unprofitable birds, it would be as well to mention that a large number of birds in the country have been individually examined and graded into three grades, viz., 1*st grade*, those which with proper treatment should lay over 180 eggs in the year. These the owner should keep for breeding from, or for selling privately at a remunerative price for the same purpose. 2*nd grade*, those laying from 100 to 180 per year; not good enough to breed from, but profitable from the point of view of producing eggs for food. 3*rd grade*, those laying less than 100 eggs per year. These birds are *not* profitable, and are only fit for killing. All should be (many frequently are) killed at home, or sold either to private customers or on the market, but, needless to say, on this basis. The method of grading is described fully in the December, 1919, issue of this *Journal*. It would be as well here to repeat (and evidently judging from observation it is necessary to constantly do so) that it is absolutely necessary to have a constant and unlimited supply of *hard sharp* grit, each piece being about the size of a wheat grain, before the birds; also granulated wood charcoal of a similar size. Many poultry keepers do not recognise the fact that nature has not provided fowls with teeth in order to masticate their food, and unless they can do so, digestive troubles of all kinds are the result, followed by malnutrition, ill-health, no eggs and unprofitableness, and the unpleasant aspect of a miserable lot of creatures moping about. This hard sharp grit mixes with food in the gizzard, and, by a rotary movement caused by the strong muscles of this organ, grinds up or masticates the food. Oyster shell, or what is called shell grit, is neither hard enough nor sharp enough, and is only used to supply lime for the egg shells. Charcoal is given as a blood purifier and germicide: as a general corrective it is invaluable for this purpose. Therefore, it is hopeless to attempt to keep fowls healthy and profitable without these two most important necessaries.

STOCK.

Cattle.—Ranching cattle should require little now in a normal season: it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

TOBACCO.

Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

VEGETABLE GARDEN.

Most seeds may now be sown, though there is risk of losses from want of rain. Watering, of course, can be resorted to. Marrows, pumpkin, melon, cucumber and peas may be planted in the field after the first rains. Tomatoes that have been sown earlier should be planted out, and these as they come on should be staked.

VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shews slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

Weather Bureau.

RAINFALL.

STATION.	1920.		Annual Total.
	May.	June.	
MASHONALAND—			
Charter—			
Buhera	0·40	...	29·32
Enkeldoorn Gaol	0 28	...	32·86
Marshbrook	0·49	...	27·35
Riversdale	...	...	29·31
Wylde Grove	0·20	0·04	32·00
Chibi—			
M'Rumi	...	1·50	17·79
Nuanetsi Ranche	0·40	...	18·62
Chilimanzi—			
Driefontein	0·72	...	29·84
Grootfontein (n.s.)	0·98	...	—
Darwin—			
Mount Darwin	0·98	0 02	38·58
Gutu—			
Eagle's Nest Ranche	0·35	...	40·76
Gutu	0·12	...	40·63
Noeldale	0·63	...	24·60
Hartley—			
Ardgowan	0·60	...	36·97
Beatrice (B.S.A.P.)	0·28	...	35·45
Carnock Farm	0·06	...	—
Cringleford	2·23	...	39·81
Elvington	0 22	...	35·83
Gatooma	0·90	...	31·67
Gatooma (Railway)	1·15	...	28·97
Gowerlands	0·24	...	37 20
Kujary	0·80	...	—
Ranwick	0·60	...	28·10
Shagari (Chevy Chase) ...	0·50	...	27·13
Spitz Kop	0·12	...	22·62
Inyanga—			
Rhodes Estate	0·61	0·40	47·60
St. Trias' Hill	0·78	0·36	40·89
Lomagundi—			
Gambuli (Mukore)	0·30	...	36·62
Sipolilo	3·30	...	43·09
Makoni—			
Carlow Farm	0·61	...	34·59
Craigendoran	0·04	0·01	33·85

RAINFALL—(*Continued*).

Station	1920.		Annual Total.
	May.	June.	
Mashonaland—(Continued)			
Makoni—continued			
Delta	0·21	...	34·62
Eagle's Nest Ranche	0·26	...	40·51
Marandellas—			
Bonongwe	...	...	31·18
Huish Estate	...	...	29·22
Marandellas	0·74	...	38·34
Selous Nek	0·19	0·05	37·64
Tweedjan	...	...	35·82
Mazoe—			
Ceres	0·28	0·08	47·36
Citrus Estate	0·16	...	37·18
Kingston	0·25	0·05	38·80
Lowdale	0·25	0·01	35·69
Mazoe Dam	0·78	...	38·69
Ruoko Ranche	0·19	...	36·12
Teign	0·56	...	39·44
Melsetter—			
Brackenbury	0·24	0·04	55·02
Chipinga	0·90	...	37·45
Mtoko—			
Mtoko	1·36	...	28·17
Ndanga—			
Bikita	1·06	...	—
Ndanga	1·12	...	46·09
Doornfontein	1·02	0·01	—
Salisbury—			
Ardbennie	0·09	0·08	43·94
Avondale	1·49	...	37·39
Chishawasha	0·07	0·20	44·73
Cleveland Reservoir	0·06	0·03	39·41
Forest Nursery	0·73	0·12	38·58
Hillside	0·35	0·07	—
Salisbury (Railway)	0·41	0·07	31·08
Vainona	0·75	0·12	39·10
Umtali—			
Chiconga	0·11	...	—
Odzani	0·07	0·20	34·17
Odzi Drift	0·08	0·01	36·32
Premier Estate	0·03	0·18	34·13
Gaol (n.s.)	0·06	0·30	—
Reservoir	0·27	0·66	35·75
Stapleford	1·05	0·70	63·14
Stralsund	0·38	...	32·20
Victoria—			
Jichidza Mission	0·73	...	39·90
Makorsi River Ranche	0·35	...	34·29
Silver Oaks	0·19	...	28·77
Victoria	0·39	...	29·69
Riverdene North	0·86	0·01	—
Stanmore	1·77	...	—

RAINFALL *(Continued).*

Station	1920.		Annual Total.
	May.	June.	
MATABELELAND :			
Belingwe—			
Belingwe N. C. (n.s.)	0·19	...	—
Tamba	0·82	...	21·58
Bubi—			
Maxim Hill	1·16	...	26·25
Bulalima-Mangwe—			
Empandeni	0·50	...	24·26
Solusi Mission	1·04	...	28·55
Bulawayo—			
Keendale	0·61	...	25·91
Gwanda—			
Gwanda (Gaol)	0·31	...	22·56
Lamulas	0·12	...	19·00
Langalanga	0·10	...	18·83
Mahalali	0·22	...	16·38
Manantji	0·26	...	13·25
Mazunga	0·28	...	12·71
Mapande	0·05	...	14·84
Mrandas	0·18	0·80	22·02
Mtshabezi Mission	0·50	...	26·11
Mwanezi	1·16	...	23·60
Sovelele	0·16	0·25	30·42
Gwelo—			
Dawn	0·40	...	28·72
Globe and Phœnix Mine	0·21	...	32·41
Gwelo (Gaol)	0·76	...	36·30
Lower Gwelo	2·40	...	30·76
Oaklands	1·43	...	36·33
Rio	0·39	...	29·15
Riverdale	0·30	...	32·19
Sikombela Farm	0·38	...	37·32
Insiza—			
Albany	0·52	...	22·40
Infiningwe	0·27	...	26·10
Inyezi Farm	0·04	...	23·00
Orangedale	0·40	...	31·61
Matobo—			
Matopo Mission	0·45	...	26·33
Nyamandhlovu—			
Naseby Farm	0·73	...	28·33
Sebungwe—			
Gokwe	...	...	33·44
Umzingwane—			
Essexvale	0·06	...	28·71
Wankie—			
Ngamo (Railway)	0·20	...	28·09
Victoria Falls	0·02	...	35·73

... means nil.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1920 August	1920 September	1920 October
			6	3	1
Bembesi	Queen's Mine Hotel	V. C. Andrews	14	11	9
Bindura	Bindura	G. Askew	5	2	7
Bromley	Bromley	C. J. Shirley	26	30	28
Charter—Mgezi	Farmers' Hall, Beatrice	W. Krienke	28	25	30
Central	Umvuma	W. A. James	8	12	10
Darwin	Darwin	H. Wessels	13	10	8
Eastern Border (South Melsetter)	Helvetia	———	..	..	..
Eastern Districts	Good Hope Farm	G. F. Robertson	4	1	6
Enterprise	Various farms	R. Philip	..	11	..
Felixburg—Gutu	Felixburg	D. R. Pyewell	7	4	2
Figtree Branch, R.L. and F.A.	Figtree Hotel	H. Charles	21	18	16
Gatooma	Gatooma	E. Seale	30	..	27
Gazaland	Chipinga	J. Myers	21	18	16
Greystone	Various farm houses, Shangani	M. Kerr	28	25	23
Hartley	Hartley	J. de L. Nimmo	No	dates	fixed
Headlands	Headlands	J. Grewar	14	11	9
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. W. Twilley	21	..	16
Insiza—Shangani	Shangani	C. H. Lewis	14	11	9
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	18	15	20
Inyazura	Inyazura	H. B. Curling	14	11	9
Iron Mine Hill	Iron Mine Hill	T. Irving	21	18	16
Lalapansi	Lalapansi	B. J. Ingle	..	..	..
Lomagundi	Sinoia	J. G. Clarkson	No	dates	fixed
Macheke	Macheke	W. L. McLean	20	17	15
Makwiro	Makwiro	D. M. Syme	28	25	30
Makoni North	Makoni	J. G. Monckton	14	11	9
Makoni	Rusape	R. C. Maclagan	7	4	2
Marandellas, Northern	Marandellas Farmers' Hall	J. Thackara	4	1	6
Marandellas, Southern	Inoro	J. Gibberd	4	1	6
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	No	dates	fixed
Mashonaland, Western Section	Various	J. W. Dunlop	No	dates	fixed
Matopo Branch, R.L. and F.A.	Sibali	S. Gillespie	11	8	13
Mazoe	Glendale Siding	Mrs. Yoxall West	..	4	..
Melsetter (North)	Various farms	R. Wodehouse	13	10	8
Midlands Farmers and Stockowners	———	———	..	25	..
Northern Umtali	Farm Summerfield	A. Tulloch	7	4	2
Norton and District	Norton Store	W. Wrench	21	18	16
Que Que	Que Que	E. J. Ross	13	10	3
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	21	18	16
Selous	Various farms	A. L. Douglas	No	dates	fixed
Selukwe	Selukwe	E. E. Somerset	..	15	..
Shamva	Shamva	Capt. N. Stanley Stallard	14	11	16
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	5	2	7
Umtali	Royal Hotel, Umtali	J. S. Holland	6	3	1
Victoria	Victoria	———	..	..	..
Vungu	Vungu	J. H. Erasmus	14	11	9
Western	Plumtree Hotel	A. Barclay			

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Distribution of Seed for Co-operative Experiments

It is anticipated that seed of the following summer crops will be available for free distribution under the usual terms of co-operative experiments. Distribution will commence about the 15th September, and will close on the 31st October.

Seed is supplied f.o.r. Salisbury in sufficient quantity to sow from one-quarter to one acre, according to variety, and not more than four varieties can be sent to any one applicant. All applications, together with full particulars regarding forwarding, should be addressed to the Agriculturist, Department of Agriculture, Salisbury.

Summer Cereals—Burt and Kherson oats, emmer, rice.

Oil Seeds—Linseed, sunflower, Spanish ground nuts.

Leguminous Crops—Velvet beans (common and white stingless), sunn hemp, dhal, vetches, beggar weed and lucerne (in small amounts for irrigated land).

Hay Crops—Teff grass, manna, Sudan grass.

Grazing and Green Soiling Crops—Kikuyu grass, Napier fodder, molasses grass.

Miscellaneous Crops—Buckwheat and field radish.

Farm Seeds for Sale.

The under-mentioned seeds grown on the Government experiment farms are offered for sale at the prices quoted. The quantities available are limited. Prices are f.o.r. Salisbury, or f.o.r. the Gwebi Experiment Farm. The distribution of seed will commence from the 15th September, except in the case of grass roots, which will be distributed from the 1st December. Napier fodder will be sold in bags containing approximately 200 roots, but no guarantee can be given of the exact number contained in each bag.

On account of the limited supply available in some cases, it is impossible to guarantee the full delivery of any order. *Farmers are therefore requested not to enclose cheques until they are advised as to the amount of seed allotted to them.* The seeds are consigned carriage forward in the case of stations. In the case of sidings the amount of railage will be notified after despatch.

1. White stingless velvet bean, 20s. per 100 lbs.
2. Ground nuts (Spanish), unshelled, 20s. per bag.
3. Sunn hemp, 25s. per 100 lbs.
4. Haricot and Canadian Wonder beans, 25s. per 100 lbs.
5. Teff grass, 6d. per lb.
6. Manna, 4d. per lb.
7. Hickory King maize, 20s. per 100 lbs.
8. Salisbury White maize, 20s. per 100 lbs.
9. Napier fodder roots, 5s. per 100 roots.
10. Kikuyu grass roots (limited amount), 5s. per 100 roots.
11. Molasses grass roots (limited amount), 5s. per 100 roots.
12. Majorda melon seed, 1s. 6d. per lb.
13. Sunflower seed, 15s. per 100 lbs.
14. Linseed, white flowering, 6d. per lb.
15. Field radish, 2s. per lb.
16. Buckwheat, 2d. per lb.
17. Black-eyed Susan pea, 25s. per 100 lbs.
18. Sweet potato slips, 5s. per 100 slips.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE AND CROPS.

No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 106. Cultivation and Preparation of Ginger.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. G. Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops unsuitable to Southern Rhodesia conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.
No. 305. Manure Supplies, by E. V. Flack.
No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.
No. 320. Maize Grading, by C. Mainwaring.
No. 327. Linseed, by C. Mainwaring
No. 344. Ensilage, by J. A. T. Walters, B.A.
No. 351. Improvement of Rhodesian Pastures, by H. G. Mundy, F.L.S.
Botanical Specimens for Identification.
No. 357. Measurement of Land, by F. Eyles, F.L.S., F.S.S.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-1919, by H. G. Mundy, F.E.S., and J. A. T. Walters, B.A.

TOBACCO.

No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.
No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.
No. 333. Tobacco Culture—Field Operations, by H. W. Taylor, B.Agr.
No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 339. Tobacco Culture; Harvesting and Curing, by H. W. Taylor, B.Agr.
No. 346. Tobacco Culture—Grading on the Farm, by H. W. Taylor, B.Agr.
No. 347. Tobacco Pests of Rhodesia, by R. W. Jack, F.E.S.
Handbook of Tobacco Culture for Planters in Southern Rhodesia, price 2s. 6d., post free outside South Africa 3s. 6d.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 348. Statistics of crops grown by Europeans in Southern Rhodesia for the season 1918-19, by F. Eyles, F.L.S.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan Government Veterinary Bacteriologist, Southern Rhodesia.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 255. Pound Fees.
—— Arsenite Cattle Dip—How to Mix.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
No. 331. Theory and Practice of Feeding Cattle in Southern Rhodesia, Part I., by R. C. Simmons.
No. 332. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part II., by R. C. Simmons.
No. 340. Notes on Theory and Practice of Feeding Cattle in Southern Rhodesia, Part III., by R. C. Simmons.
No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part IV., by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 359. Hints on Dips and Dip Testing, by A. W. Facer, B.A.

DAIRYING.

No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 205. Home Butter Making, by R. C. Simmons.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 328. Pont l'Eveque Cheese, by J. B. Fisher, N.D.D.
No. 329. Gervais Cheese, by J. B. Fisher, N.D.D.
No. 356. Cream and its Production, by T. Hamilton.

VETERINARY.

No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 82. Difficult Parturition of the Cow, by C. R. Edmonds, M.R.C.V.S., G.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.

No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 272. African Coast Fever: Schedule of Outbreaks to 1916, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.
No. 312. Anthrax, by C. R. Edmonds, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
No. 316. Inoculation of Cattle against Redwater and Gall-sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 324. Infectious Abortion of Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
Services of Government Veterinary Surgeons.
No. 352. African Coast Fever, by L. E. W. Bevan, M.R.C.V.S.

IRRIGATION.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W M. Watt.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
No. 349. The Hydraulic Ram, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
Irrigation—Advice.

FORESTRY.

No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 315. Descriptive List of Trees and Shrubs at Forest Nursery.

HORTICULTURE.

No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 296. Citrus Nursery Work, by A. G. Turner.
No. 354. The Home Orchard, by A. G. Turner.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworm, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.

No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.
No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S
No. 291. Cutworms, by Rupert W. Jack, F.E.S.
No. 295. Tsetse Fly in Southern Rhodesia, 1918, by Rupert W. Jack, F.E.S.
No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.
No. 353. Further Experiments with Poisoned Bait on Maize Lands, by R. W. Jack, F.E.S.

POULTRY.

No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard
No. 330. Poultry Keeping in Rhodesia—Incubation, by A. Little.
No. 335. Poultry Husbandry: The Rearing of Chicks, by A. Little.
No. 337. Poultry Diseases: Enteritis, Tuberculosis, Coccidiosis.
No. 343. Poultry Husbandry; Breeding and Selection for Increased Egg Production, by A. Little.
No. 355. Poultry Husbandry—Principles of Breeding and Mating, by A. Little.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 254. Hints on Explosives, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
No. 358. Notes on the Regulations governing the Sale of Fertilisers and Farm Foods, by E. V. Flack.
No. 360. Notes on the Rainfall Season 1919-20 in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

R. A. R.—Officer just demobilised, with seven years' South African experience, wants opening on stock farm. Age 39. Understands management of all farm animals.

A. J. S.—Wants situation as farm manager. Experience of dairying, orchards and general farm work.

S. A.—Wants situation as farm manager. Experience of dairying in Denmark and South Africa. Age 25.

"Q."—Farmer has 200 acres of land within 15 miles of Salisbury available on half shares for tobacco and other crops.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 333 of 1920.] [25th June, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water:—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
The Mashonaland Agency, Limited	Gwelo	Gwelo	Farm Retreat

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 366 of 1920.] [16th July, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water:—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
British South Africa Company	Marodze	Lomagundi	Sinoia Citrus Estate

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 297 of 1920.] [11th June, 1920.

TSETSE FLY, WANKIE DISTRICT: OPEN SHOOTING AREA.

IT is hereby notified that His Honour the Administrator in Council has been pleased, under the provisions of the "Game Law Consolidation Ordinance, 1906," to suspend the operations of sections 9, 10 and 12 of the said Ordinance in respect of all game within the following area in the Wankie district from date hereof.

Description of Area.

From the railway bridge across the Gwaai River, thence down that river to its junction with the Inyantue River, thence along the southern and western boundaries of the Wankie Native Reserve to the Lukozi River, thence up that river to where it crosses the railway line and along the railway line to the first-named point.

Government Notice No. 202 of 1919 is hereby cancelled.

No. 298 of 1920.] [11th June, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 466 of 1919 declaring an area of infection and guard area in the Victoria native district.

No. 299 of 1920.] [11th June, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 78 of 1920, and in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard area in lieu thereof :—

MELSETTER NATIVE DISTRICT.

(a) *Areas of Infection.*

(1) An area comprising the farms Glencoe, Hayfield, Mermaid's Grotto, Rumble Rills, Tarka, Springfield, Tilbury, Dunstan and Welgelegen; (2) the farm Sawerombi; (3) the farm Constantia.

(b) *Guard Area.*

An area comprising the Ingorima Reserve, the farms Forest Glade, Springvale, Orange Grove, Roede, Nyhodi, Nyaruma and Scott's portion of Thornton.

No. 342 of 1920.] [2nd July, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area :—

MATOBO NATIVE DISTRICT.

(a) *Area of Infection.*

Sauerdale, excluding the fenced portion of Westacre Creek Farm.

(b) *Guard Area.*

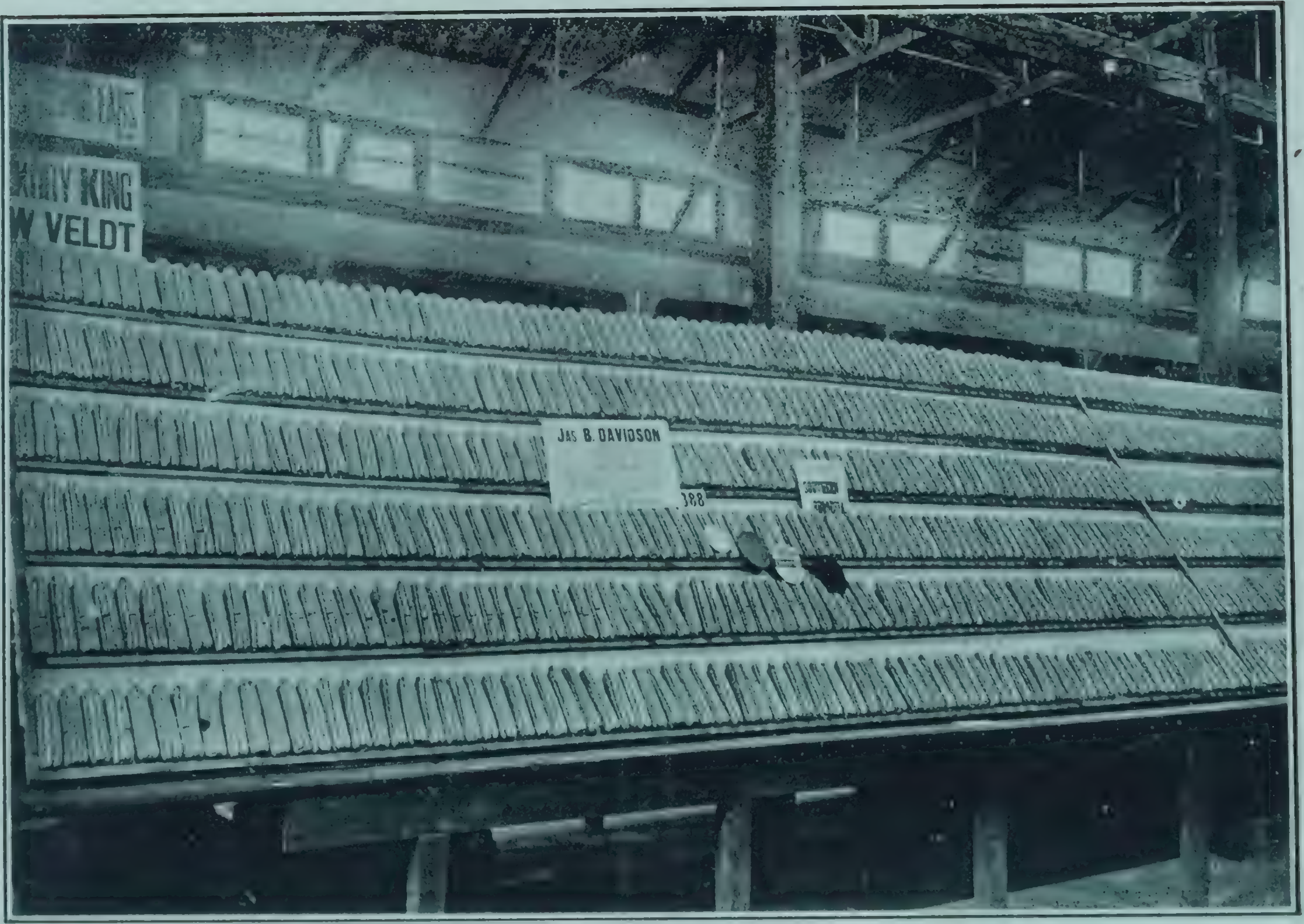
Bulawayo, Matobo, Bubi and Umzingwane Native Districts.

An area bounded by and including the farms Letterstedt, Welcome Ireland, Blewbonny sub-division A, Craiglee, Stonycrofts, Slights, Helenvale including sub-divisions, Seaborough, Umfasimete, Fundisi, Mbesu Kraal, Driehoek, Maldon, Imbesu Block, Heany Junction Farm, Kirton, Wilsondale Surplus, Springvale, Woodlands, Ballerat, Adams, Florencedale, Absent Society Brethren-in-Christ Mission Farm, Matopo Block, World's View, Hazelside, Lonsdale, Westacre Creek, Klipspring and Joe's Luck.

No. 332 of 1920.] [25th June, 1920.

IT is hereby notified that His Honour the Administrator has been pleased to approve of the payment, from date hereof, of the following rewards for the destruction of wild dogs, in lieu of the amount stated in Government Notice No. 201 of 1916 :—

For each full-grown wild dog	10/-
For each wild dog pup	5/-



Johannesburg Show. 1920. Messrs. Glanfield & Rattray's 500 ears low veld Hickory King maize. First prize, champion and grand championship

THE RHODESIA

Agricultural Journal.

Issued by the Department of Agriculture.

PUBLISHED BI-MONTHLY.

VOL. XVII.—No. 5.] OCTOBER, 1920. [5s. per annum.

Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

Meat Export Trade.—The rapid and most satisfactory increase in the numbers of our cattle—now over one and a third million and likely within three years to number about two million head—renders urgent the question of disposal of the final product, the beef. It is obvious that a somewhat precarious phase has to be faced by every manufacturing industry, and cattle raising from the moment that local needs are exceeded until the output is sufficient to warrant the establishment of some commercial means of disposing of the excess is in a similar position. In our case this involves an anxious period until our cattle are sufficiently numerous and sufficiently good to justify a regular and reliable export trade. The mere count alone will not suffice. The average weight at a moderate age must also be such as to justify the establishment of means for handling the product. Hitherto the southern markets have stood us in good stead in providing an outlet for whatever surplus cattle we have had, and it is earnestly to be hoped that this open door may long continue. This outlet, however, is at best a doubtful one, and should the demand there slacken through increased local production or other causes it might at any day be closed to us.

Even if the protective and preventive policy of Northern Rhodesia, which has so far barred the Congo markets to us, should be amended, yet the duration of the journey from Bulawayo to Elisabethville must of itself remain a serious hindrance to the sending of live cattle to that distant point.

These considerations render the cessation of the activities of the Odzi Canning Factory very regrettable. The occasion and necessity for this step do not appear to be due in any way to local reasons, but are attributable entirely to world-wide causes. Put simply it amounts to this, that corned beef and extract of meat are to-day a glut in the world's markets, and are likely to remain so. In this connection it is worthy of note that Liebig's great and world-renowned factories at Frey Bentos in South America have quite recently been converted from a manufactory of essence and "bully" to freezing works for the export of meat. Tinned corned beef and meat extract were formerly prime products; they have now been relegated to the position of side-lines. The markets of the world are adapting themselves for the sale and distribution of frozen and chilled meats to regions where formerly such commodities were unknown, and corned meat which did so much to help to win the war is now a by-product only of the freezing works, and as little of it as possible is produced. In these circumstances there is little prospect of success for a factory purely for the production of this article alone, of which there is a momentary glut, and of which permanently more than enough can always be produced at any time.

It does not, therefore, seem likely that the canning factory can recommence on the lines of the past, but will adjust its activities to altered circumstances and to the changing conditions of the world's meat consumption.

The journey from Bulawayo or Messina to southern markets, though at present perforce undertaken, is undesirable for live stock both from a commercial or humanitarian standpoint and would in other countries be illegal. The same holds good for live cattle that might be sent to the Belgian Congo. The time would appear to be ripe for the provision of meat freezing works in Southern Rhodesia, providing thereby for the supply of fresh beef in place of live animals to consuming centres in this country, as well as for markets to the north and the south of us, with an export trade of our finest products overseas. At the same time important local industries dealing with fat, hides, bone, horn and other side-lines would develop wherever there was a sufficiency of the necessary raw materials.

No doubt some rivalry is to be anticipated as to the site for such industries, and probably more than one factory will eventually be established. Obviously Bulawayo or that vicinity offers certain advantages, whilst Odzi with its existing facilities for slaughter and preparation of carcases only requires freezing chambers and cold storage at Beira to enable it to export to Europe as advantageously as it can be done from Madagascar, Durban or Lourenco Marques to-day. The extent and situation of Rhodesia are such as to warrant more than one centre for the handling of cattle, which constitute, it must be remembered, by far the most important element of our entire farming industry.

Importation of Cattle.—We publish at the end of this *Journal* a Government Notice which contains important amendments to the regulations governing the importation of cattle into Southern Rhodesia. Hitherto it has only been possible to import (except pedigree stock) cattle possessing not more than two permanent incisor teeth. The age limit is now extended to include non-pedigree cattle of any age and cattle with not more than six permanent teeth. In the former case the cattle must have been in the owner's possession since birth, and in the latter for three months.

We have omitted the three annexures referred to in the notice, but the necessary forms and all information regarding the subject can be obtained from the Veterinary Departments at Salisbury and Bulawayo.

Imperial Entomological Conference.—Mr. R. W. Jack, Agricultural Entomologist, returned recently from a brief visit to England, undertaken for the purpose of attending the Imperial Entomological Conference as official delegate for Southern Rhodesia. This conference, the first of its kind, was the outcome of efforts on the part of the Imperial Bureau of Entomology, of which Dr. Guy A. K. Marshall, C.M.G., well known to the older citizens of Salisbury, is director. The conference proved of great value to all who attended it, and the various delegates very greatly appreciated the opportunity of meeting their co-workers from other parts of the Empire, and of discussing their respective problems and difficulties.

Amongst other important subjects discussed was the tsetse fly problem. At this particular meeting the chair was taken by Major-General Sir David Bruce, pioneer investigator of the part played by tsetse fly in transmitting "nagana" (fly disease) to stock, and many of the most eminent British workers on the problem were present. In opening the discussion, Mr. Jack gave the conference an account of the fly in Southern Rhodesia, and described the experiments being carried out by the Administration at the present time. Subsequent speakers expressed great interest in these experiments as constituting a really practical attempt to grapple with the problem, and expressed the hope that they would be continued until definite conclusions could be drawn.

The meeting also discussed a scheme drawn up by the Imperial Bureau of Entomology, under which six separate stations would be established in different parts of Africa for the purpose of studying the more important species of tsetse flies. Southern Rhodesia was suggested as one of the localities, and in view of the vast importance of the tsetse fly problem to the settlement and development of the British African dependencies, it is to be hoped that the plan will materialise.

Lectures on Agriculture.—A short course of lectures on agriculture and allied sciences, similar to those originally conducted in 1913 and 1914, were held in Salisbury during August. The lectures were well supported by prospective farmers, both Rhodesian-born and from overseas, including half-a-dozen ladies, the attendance ranging from thirty to forty and occasionally more. The course was entirely free, and facilities were given enabling persons from a distance to attend.

It being obviously impossible to give a comprehensive technical education in three weeks' time, no such ambitious project was attempted, but a brief survey was given of salient facts relating to pastoral and arable farming in Southern Rhodesia, together with some idea of the bearing of chemistry, entomology and botany thereon. The technical officers of the Department of Agriculture gave their services freely, and explained their subjects as far as possible in the few hours available.

That some measure of success resulted was made apparent from the results of the examination to which seventeen of the students submitted themselves. The first place, as shewn by an aggregate of marks, was secured by Mr. F. S. Pascoe, of Salisbury, closely followed by two of the lady students.

A large measure of success has attended this effort, although it is recognised that there is still room for improvement in the way of rendering the course more attractive. It has repeatedly been suggested that the lectures given should be published. Apart from the fact that much of the subject matter has from time to time been fully dealt with in the pages of this *Journal*, and will continue to be here treated, it must be remembered that information can often be conveyed by mouth in ways impossible on paper, and that the power of the spoken word is far greater than that of the pen. If it were otherwise, there would be little call for colleges and universities, and education by correspondence classes might be general.

At Gwelo some time ago two days were devoted to such lectures, and the excellent attendance and interest shewn demonstrated the keenness of farmers to learn. Such brief courses of instruction by lecture and demonstration are of more practical use than much writing. The Department of Agriculture will always be glad to arrange such meetings where the desire is manifested.

The support given to the course of lectures at Salisbury has been such as to warrant repetition next year and until such time as Rhodesia can afford a proper school of agriculture as exists in all other countries in which farming is a dominant industry.

Forestry.—Mr. J. S. Henkel, Forest Officer, asks us to state that owing to the numerous applications for his services, he will be unable for some considerable time to accede to all the requests he has received to address meetings of farmers' associations. He will, however, endeavour to convey through the medium of this *Journal* advice regarding matters pertaining to forestry, and we therefore advise all concerned to look to this source for guidance.

In referring to this matter, we would comment upon the fact that advice is frequently sought upon subjects which have been comprehensively dealt with in the pages of this *Journal.* This applies to subscribers as well as to non-subscribers. To the former we would say *read your Journal*; to the latter we would suggest that the small amount of the subscription will be amply repaid by the information published. The *Journal* is issued for the benefit of farmers in Rhodesia, and they will find that many matters on which they seek advice are dealt with in its pages.

Trout.—It is within the knowledge of most people that in past years several attempts have been made to acclimatise trout and other European fish in the rivers and dams of Southern Rhodesia. From time to time encouraging proofs have appeared that some measure of success has attended these efforts. Recently two trout were recorded weighing one-and-a-quarter and one-and-three-quarter pounds respectively, and at another point trout were found twenty-three miles from the spot where they had been placed in a river three years before.

It has been found impossible to import the young fish in the "alevin" stage, but we know from actual results that the ova imported from the Jonkershoek Hatchery near Stellenbosch have done exceedingly well.

The pioneers in this work were Messrs. Dimmock and Rawson, and we understand that Messrs. Peech and Verreker have also taken an active part in the hatching and placing of trout in rivers for some time past, whilst several gentlemen in Umtali tried to introduce trout into the rivers there. The result of these experiments has undoubtedly demonstrated that with the pursuance of proper methods trout can be hatched out and thrive, of course having due regard to the stream in which they are placed. Such fish as carp and tench will do very well in any dam in Rhodesia.

Formerly there was a trout hatchery at Potchefstroom, but for some reason this has been closed down and is not available for the supply of ova to Rhodesia. The Frontier Acclimatisation Society at the Pirie Bush, having its headquarters, with an honorary secretary, at Kingwilliamstown, has sent many parcels of ova to this country, but owing to the possibility of such parcels not connecting with the Rhodesian train at Kimberley, many of the contents have arrived dead. The trout hatchery at Jonkershoek, run by Mr. Chaplin, is the best source from which we look for our ova at the present time. Such is the demand that it is necessary for anyone applying to communicate very early in the year with the Secretary, Provincial Council, Cape Province, to obtain their ova in June-July, during which months distribution is effected from Jonkershoek.

A generous offer by a pisicultural enthusiast, who desires to remain anonymous, has been made to supply trout-hatching boxes of either the floating or stationary type for the use of persons prepared next season to procure ova and hatch and place out trout in our rivers.

It has been suggested that the time is now ripe for all interested in the gentle art of angling to unite for the encouragement of this sport in regard to both native and European fish in Rhodesia by forming an Izaak Walton club or an ichthyological society for the promotion of this object. All interested are invited to correspond on the subject with the Director of Agriculture, Salisbury, who will be pleased to give them all information regarding the hatching out of trout and the boxes which must be used in connection with the same.

S.A. Cattle Breeders' Association.—We welcome the establishment within the Union of a body under the above designation and on the lines of the association of a corresponding nature already in existence in Southern Rhodesia. The new association in the south came into being at the time of the recent Rand Fat Stock Show as the result of patient preliminary spade work by stock owners interested in the future welfare of the cattle industry.

The objects indicated in the articles of association are much on the same lines as those of the Rhodesia Cattle Breeders' Association, and it is interesting to find that they include powers "to amalgamate with any other association in Southern Rhodesia, Northern Rhodesia, South-West Protectorate and British Central and East Africa having objects altogether or in part similar to those of this association, and to enter into any arrangement with any such association for mutual co-operation, affiliation or the like." Moreover, membership is permitted to European persons domiciled in Northern or Southern Rhodesia, so that already the sphere of the South African Association includes that covered by our own body.

The formation of societies representative of a particular interest such as cattle, maize, poultry, fruit and the like, as apart from general agricultural societies of districts, is a growing feature and a sign of the times. Such combination for mutual advantage has become necessary and our own Cattle Breeders' Association requires the whole-hearted support of the stock owners of Rhodesia to deal with the pressing problems of the moment, particularly with the question of an outlet for our rapidly increasing cattle of marketable age—a matter of urgency.

The Aberdeen-Angus Cattle Breeders' Society of South Africa.—We have received a copy of the society's annual report for the year ending 30th June, 1920, from which we note that the membership now totals 100, of which 31 are domiciled in Rhodesia. The society does not yet possess a separate Herd Book, and the Aberdeen-Angus section is published in the South African Stud Book. The number of entries is 478 and 150 transfers. In connection with fat stock matters it is placed on record that the winner of the "block test" at the show in Johannesburg last year weighed 1,120 lbs. at the age of one year and nine months, and when killed dressed at 682 lbs., giving the highly satisfactory percentage of 60.89. The headquarters of the society is at Parys, O.F.S., and the secretary is Mr. George Wilson.

A Maize Cobber.—There was lately on view in Johannesburg in course of construction a patented implement for the purpose of removing the cob from the maize stalk. This was a mechanical harvester, little heavier than a planter, and capable of travelling along a row of mealies and removing and throwing into a hopper all the cobs, whether set low or high, and whether there were one or more on a plant. The machine has been in actual use, and a number are now being manufactured. Arrangements have been made for giving it an early trial in Rhodesia, where, if it proves as successful as it promises, it is likely to command a ready sale, and may prove a great boon to the maize grower.

A Tyre Tightening Device.—Another ingenious device, this time of Rhodesian origin, consists of a contrivance for tightening a wagon tyre on the felloes, thereby saving considerable time and expense. The tyre is specially constructed and is patented. It is to be hoped that such a tyre will one day be procurable for any size of wagon wheel.

The Devon Cattle Breeders' Society of South Africa.—The financial and general report of the society for the year 1919-1920, which was to be presented to the annual general meeting on the 1st September, discloses the fact that the year's work has been eminently satisfactory. The society has its own Herd Book, and for inclusion in the second volume there are about 90 males and 185 females, with 100 transfers. The membership has been revised, and it has been decided to let it stand with 35 Union, 46 Rhodesian and 4 overseas members. The secretary of the society attended the Bulawayo Show in May, and reports that a keen spirit is abroad in Rhodesia. It is stated that a good and firm connecting link must be maintained, and that the views of Rhodesian members would be laid before the society for sympathetic consideration.

The report goes on to state that during the past year prices have improved, on a very conservative estimate, at least 50 per cent. The society as a body has been largely responsible for this, and members are asked to shew their appreciation by aiding the good work, by showing and advertising, not only in their immediate vicinity, but in those places where the Devon is little, if ever, seen.

"**Cattle Cleansing Ordinance, 1918.**" Some misconception appears to exist in regard to the provisions of the Cattle Cleansing Ordinance of 1918. The idea is prevalent that the owner's liability ceases if cattle are dipped every seven days; again that the penalty of the law cannot be enforced unless there are ten or more engorged ticks on a beast. This is not so. The Ordinance provides (1) that cattle shall not have on them ten or more engorged ticks, not being bont or bont-legged; (2) that cattle shall be dipped every seven days; and (3) that the dipping fluid shall be of the prescribed strength. Neglect to comply with any one of these provisions is a penal offence.

The full text of the Ordinance was printed in the *Rhodesia Agricultural Journal* for October, 1918, and cattle owners are advised to make themselves fully acquainted with its provisions.

The Rhodesian Land Bank, Ltd. The report of the Directors of The Rhodesian Land Bank, Ltd., states that it is proposed to pay a dividend of 4 per cent. free of tax, in respect of the year 1919. Applications for advances received during the year numbered 152 for a total of £114,085, against 140 for £74,500 in 1918. Advances made numbered 82 for £41,200, against 80 for £26,674. The average amount of the loans made was £502, against £333 in 1918. The purposes for which loans were granted were:—

Purchase of land	55.49	per cent.	against	45.96	in 1918.
Discharge of existing liabilities on land	22.09	,,	,,	15.88	,,
Purchase of live stock, plant, etc.	15.28	,,	,,	28.62	,,
Improvements	7.14	,,	,,	9.54	,,
	100.00			100.00	

Of the 82 loans issued during the past year, five were made in Northern Rhodesia, and 77 were made in 17 different districts of Southern Rhodesia.

Sixty-three of these loans, amounting to £39,075, were secured by first mortgage, and 19 for smaller sums (none exceeding £150), amounting to £2,125, were made on guaranteed promissory notes for periods not exceeding twelve months. The loans granted by the Bank to 31st December last numbered 863 for £496,770, against 781 for £455,570 at the end of the previous year. The amount outstanding at 31st December, 1919, was £309,338, against £324,783 at 31st December, 1918.

The amount received during the past year in repayment or in reduction of loans was £56,337 15s. 8d. (against £25,894 2s. 11d. in 1918), of which £17,715 (against £9,154 in 1918) was transferred to the purchasers of farms over which the Bank held bonds. Twenty-two sales of farms bonded to the Bank took place, and, as in previous years, the prices realised shewed satisfactory margins over the Bank's advances.

Mr. W. Olive, who has been Manager of the Land Bank since the commencement of business in 1912, having been permanently transferred to the service of the British South Africa Company, the Board has appointed Mr. W. R. D. Lewis as Manager.

Fertilisers.—The inauguration by De Beers of a large fertiliser factory at Somerset West, Cape Province, is a matter of considerable importance to farmers in this country. The difficulty of obtaining fertilisers in anything like adequate quantities has severely handicapped farmers, especially tobacco growers, and the prospect of ample supplies will be welcomed. We are given to understand that the new factory will commence operations early next year, and it is proposed to extend the business to Rhodesia. If by this any reduction in the present high prices results, the factory will confer a boon on the farming community.

Hoven.

In connection with the loss which some farmers suffer from hoven in stock, generally due to eating lucerne, though also contracted otherwise, we have received from Mr. Cockerell, of Old Umtali, the assurance that a certain remedy which he has used in many instances consists in a dose of kerol: one dessertspoonful in a bottle of water in the case of calves up to four months old; two tablespoonfuls in two bottles of water for full grown animals. This very simple treatment deserves to be widely known.

Forestry in Rhodesia.

THE MANAGEMENT OF WOODS.

By J. S. Henkel, Forest Officer.

Young stands of forest trees of introduced kinds exist in various parts of Rhodesia, and it may not be out of place to give some hints as to the manner of managing them so as to secure the best results. This article is not intended to replace instruction in the field, but since it is impossible for the Forest Officer immediately to visit all the plantations in the country, it may be of use to farmers to know something about tree growth and the principles which are employed in treating and cultivating forest crops.

It is taken for granted that every farmer in Rhodesia realises the importance of, not only producing timber for consumption on the farm, but also to have some for sale. There is also the question of growing trees to beautify the homestead and to protect agricultural land, orchards and stock, and to afford shade during the hot summer months, and protection from bleak winds during the winter.

As in the case of agricultural crops a farmer's business is to adapt his trees to the soil conditions, climate, aspect and elevation. Trees are living things and depend, as all life does, on an adequate supply of water. In this country there is a long dry winter and spring season, which, however, does not exclude tree growth, as may be noticed in the case of many of the indigenous trees and shrubs as well as certain exotic trees. This growth during the rainless period is possible, because the trees, by means of their roots, are in touch with supplies of water. It is not generally realised to what depth roots can penetrate. In British Bechuanaland the roots of the Camelthorn (*Acacia giraffæ*) have been found at a depth of 80 feet. In Western Australia the roots of some eucalypts have been known to reach a depth of 300 feet. It is probable that the roots of most of the Rhodesian trees are deep-rooted, and evidence of this may be seen along railway and road cuttings. Generally speaking the dryer the climatic conditions the greater are the provisions made by trees for securing a continuous supply of water. Schimper in his "Plant Geography" stated:—"It is neither frequent atmospheric precipitation nor a rainy vegetative season that is of importance, but it is the continuous presence of water within easy reach of the extremities of the roots. It is immaterial during what season of the year this supply is renewed." In introducing exotic trees it is obvious that the policy to be followed should be to select trees which have a deep-rooted system. This applies to both evergreen and deciduous trees.

Southern Rhodesia varies greatly in climate, soil and flora, and much research work has to be undertaken to correlate the flora with climatic, soil and geological conditions. Experimental plantings of many species of exotic trees in different localities will eventually afford data from which conclusions can be drawn as to the best species for any specified area. The experiments made by many residents throughout the Territory have paved the way for the drawing up of provisional conclusions, and these are being used as a basis for giving advice to those anxious to grow timber trees.

In every business, the more one knows about the details the better one understands the difficulties and problems which have to be surmounted and the possibilities. So with trees. Most trees originate from seed, and by means of foliage and roots build up cell tissues. The food material is obtained from the air and the soil. Trees, like other plants, rely upon moisture, heat and light for performing the functions of growth. It is unnecessary to discuss in detail the exact methods used by a tree to build up its body. Suffice it to say that the green parts (leaves) by a process called "assimilation" prepare the food. Assimilation only takes place when the leaves are exposed to light and air. If other conditions are favourable the more foliage a tree possesses the more vigorously will it grow.

The roots of a tree, besides giving stability, are the organs through which water is obtained. The largest part of the water which passes through a tree is transpired. This amount varies with the species, its age and the climatic conditions. The amount of water transpired per acre from a close type forest may be from 500,000 to 1,500,000 lbs. per annum. The amount of mineral substance taken up is comparatively small, and the bulk of this is retained in the leaves and returned to the soil when the leaves are shed. The moisture in the soil is the most important element in it for tree growth, and the more accessible this is the better the tree grows. A soil which is porous, evenly moist, deep, and well drained is the soil on which trees grow to best advantage.

The light conditions have a profound influence on tree growth, and are largely responsible for the shape of the tree and its rate of growth. If trees are kept unduly crowded the tendency is to produce long straight boles with little crown development. The amount of crowding which is possible varies with different species. All trees thrive best in the full enjoyment of light, but their energy goes into branches. It is the art of the forester to know the different light requirements of the species cultivated, and to give to each the greatest amount of space for development without producing heavy branches.

The rate of growth varies considerably with the species, and in different soils and situations, and for this reason comparisons of rate of growth can only be made where trees grow under the same conditions. In forestry practice it is the volume produced per acre which is of importance. In early youth a stand may carry 600 to 1,200 stems per acre, but this number is rapidly reduced either by being crowded out or by thinnings made from time to time. By the time the stand is finally cut there may be only 200 stems per acre or less. It is not the number of stems, but the volume of cubic feet per acre which is of importance. It will thus be seen that merely mentioning the number of trees planted conveys very little information. It is the acreage and the volume on it that is important.

The writing of this article has been prompted by the fact that there exist in Rhodesia many excellent stands of trees which would have been much better and given better results had the owners some knowledge of the principles of tree growth. It would obviously be the better course to give practical demonstration and oral instruction, but since this is not possible, it is hoped that a simple statement of procedure devoid of technical terms will be helpful to all lovers of trees.

It is assumed that on a farm there are young woods in forest form; that is to say the trees have been planted, say, 6 feet by 6 feet or 8 feet by 8 feet or other suitable espacement, and that there are plots of different ages and all are some species of eucalyptus. It is further assumed that the usual precautions have been taken to protect the trees from injury by cattle and from fire. If such is the case the question sooner or later must occur to the owner, namely, What is the correct manner to treat the woods so as to get the best results? The answer to the question presents a number of difficulties, and some farmers take the line of least trouble, and simply let the trees alone, or what is worse, send a native to cut poles when these are wanted on the farm. In the latter case the native is sure to cut the best trees of the best kind, and if this process is continued long enough, the farmer finds himself with a lot of poor useless timber. In the former case the lack of proper thinning leads to loss of increment, and in some cases the death of the trees themselves.

To manage a plot of trees correctly it is necessary to make use of a little common sense and get hold of some of the main principles of growth. There is no rule of thumb method. To manage a wood correctly is an intellectual effort necessitating quick thinking and the weighing of many factors. Correct decision and action produces results which seem incredible until tried. The farmer who has incurred the expense of creating a forest is naturally anxious to get the best returns and incidentally the pleasure of seeing the woods thrive under his care.

In a wood which has been neglected there are as a rule some trees which are crooked, forked and diseased; these should give way to straight sound ones. Next to the removal of the stems referred to above, the principal tending operation is that of thinning, and by its aid it is sought—

(1) to prevent loss of growth owing to insufficient crown development;

(2) to prevent windshakes in timber, which are more liable to occur in unthinned woods where the individual trees have developed into long thin stems with small crowns;

(3) to prevent excessively long poles being developed at the expense of diameter growth;

(4) to encourage good crown development.

After a young wood has been established and the trees are about 5 to 7 feet high, a very important operation, with far-reaching effects, should be taken in hand. This operation is simple and easily carried out, and consists in removing any double leaders as well as strongly developed branches likely to cause a fork. The rule to remember is, one root system on stem, and this stem to be undivided at least as high as a man can reach. The light leafy branches, which are not likely to develop into heavy branches, are not to be removed; these will eventually die as a result of shading. An ordinary clasp knife is all that is necessary for the operation. In the case of trees with a low branching habit, such as some varieties of *Eucalyptus rostrata*, it is necessary to repeat the operation for a season or two. It is time well spent, for a forest results of clean straight stems. In some cases where a stem persists in a bad habit, cutting it off at the collar and inducing a strong coppice shoot often cures the trouble. Having directed the young trees into right channels of development, there is very little to do until canopy has formed and the lower branches begin to die as a result of lateral shading. When the trees are about five years old the first thinning should be made. Before any thinning is made a definite policy should be determined upon. If, for instance, only firewood is desired or a large supply of small poles for various purposes, the wood may be clear cut and the trees allowed to coppice. If on the other hand the object it to produce timber of large dimensions as well as poles (this is generally speaking the better course to follow), then proper thinnings must be made. To thin a wood correctly is an art which takes some time to acquire, and yet the principles are easily learnt. It is their application which is difficult. In the first place it is necessary to dispel some erroneous ideas. One frequently hears such expressions as "cutting out alternate rows." This is a rule of thumb method which is so obviously wrong that it is only necessary to call attention to it by means of a parallel case. For instance, a farmer has 1,000 head of cattle and a farm which will only suffice for 500. Does he dispose of every alternate animal, or does he select the best 500 and dispose of the rest? Another wrong idea is to try to thin a wood to a definite number of stems per acre. There is only one safe way of thinning a wood, and that is to be guided by the crown development. And if this rule is carried out it automatically follows that the number of trees on the ground will be the smallest number "which will secure the greatest amount of wood growth in the most desirable form of which the soil and climate are capable."

If any unthinned plantation of eucalypts, say, five years old, is inspected, it will be noticed that certain trees have grown better than others; they have larger crowns, are more heavily foliaged and usually have straighter stems. These better stems are irregularly scattered through the grove, sometimes in groups, in other cases as isolated trees. Some of the trees are considerably taller than others. Furthermore a large number in the stand are below the average height, and some will be found to have made very little growth, being left behind very early in the struggle for light. The several types of trees are divided into three classes, namely:—

(1) The dominant trees—the tallest and best developed trees.

(2) The dominated trees—trees which are a good second to the dominant trees, but not quite as tall, and usually with smaller crowns.

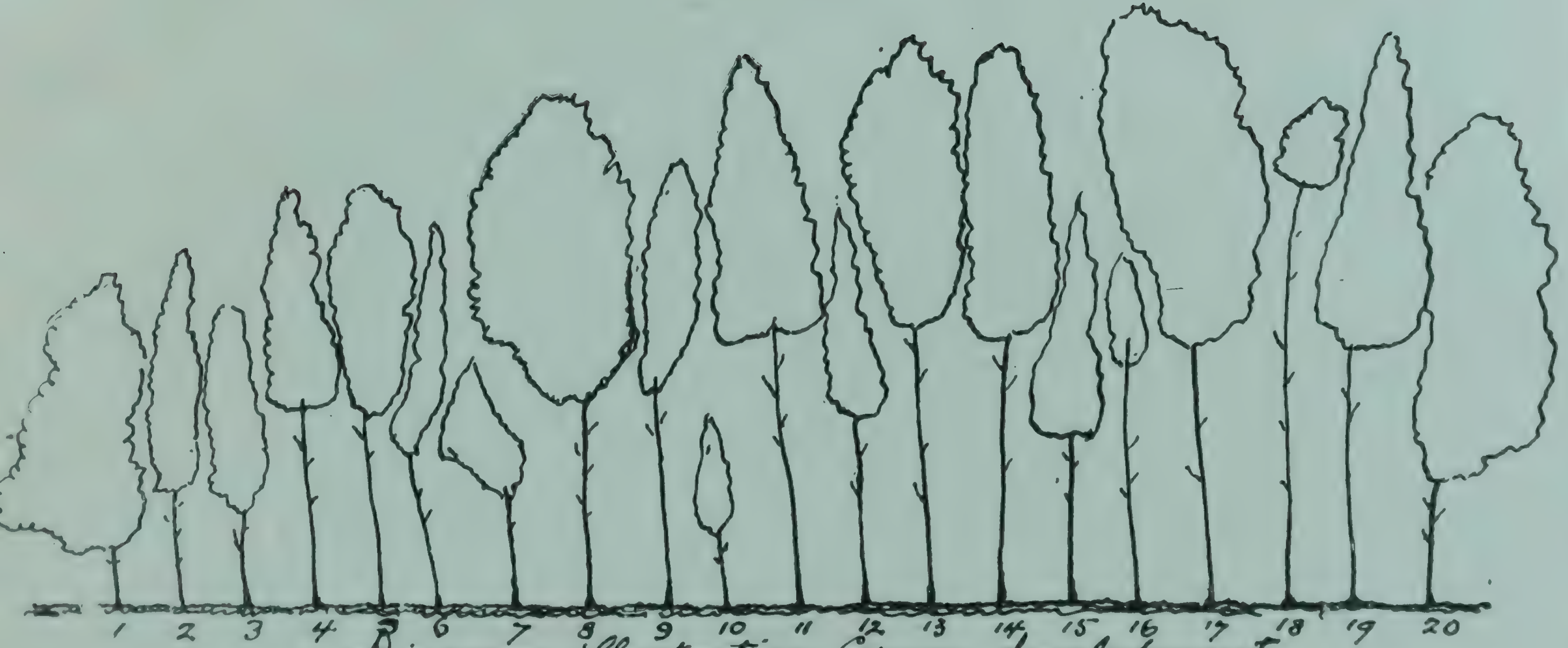


Diagram illustrating Crown development.

Class I. Dominant trees, Nos. 1, 2, 4, 5, 8, 11, 13, 14, 17, 19. 20.
Class II. Dominated trees, Nos. 3, 6, 9, 18.
Class III. Suppressed trees, Nos. 7, 10, 12, 15, 16.

(3) The suppressed trees—trees which have been left behind in the struggle for existence, and usually have small pinched crowns and sickly appearance. (*Vide* illustration of tree classes.)

With a little practice it will be easy to place any tree in a forest into the class to which it belongs.

In thinning a wood the best plan of action is to select the best and vigorously growing trees, *which are to be retained.* Keeping these in mind, the next step is to ascertain which trees are interfering with the proper development of the best ones; these are *trees to be removed.* All trees to be removed should be blazed with an axe. Obviously there is no difficulty about suppressed trees; all these should be cut. The only exception is where a big gap is likely to occur. More care is required in removing dominated trees. If there is any doubt spare the tree until a later stage. It is better to err on the side of under-thinning than over-thinning. A little practice and study of the effect of removals will soon shew the intensity with which thinnings can be made. It must be remembered that the object is to give greater growing space for the best trees.

In executing the thinnings it is a good plan to remove suppressed trees first, because it simplifies the selection of the dominated trees, the reason being that there are fewer trees to confuse the judgment.

The operation of thinning is repeated from time to time, and if correctly done the final crop will consist of trees approximately the same size which are well grown, of even taper, and containing valuable timber.

All trees selected for felling should be cut level with the ground, or at most not more than 4 inches from the ground level. If the thinnings are made in summer there is less chance of the stools coppicing, but even if they do there is no great harm in leaving the stool shoots; they help to form an understory, which has its advantages. The trees forming the margin of a wood should be encouraged to produce low branches so as to form what is called a "wind mantle."

The management of coppice woods varies according to the object in view. To get the best results fellings should be made in winter; the stool should be level with the ground, or not more than 4 inches above the surface, and then with an even slope in one direction, so as to facilitate rain-water drainage. When the best leaders are clearly developed and are about 10 feet high, select the two or three best for the new crop and remove the rest. If the object is to convert coppice into high forest, only permit one good leader to develop.

For the purpose of illustrating the manner of carrying out thinnings a eucalypt wood has been selected. For thinning woods of other species the same general principles are made use of.

In conclusion it may be stated that the trees in a wood are good or bad investments and should be managed on financial principles. Trees which are growing vigorously should be preserved. Trees growing indifferently may be cut or preserved. Trees no longer adding adequate growth should be cut and utilised. The farmer who tends his woods properly will never regret the time and interest taken in them.

Quarter-Evil.

By C. R. Edmonds, M.R.C.V.S., Assistant Chief Veterinary Surgeon.

This disease is one of the oldest known of all diseases, and is also known by a great variety of names, such as Black-leg, Quarter-ill, Black-quarter, Symptomatic Anthrax, Struck, etc. In South Africa it is commonly called Sponsziekte. The disease occurs in all the great continents, but it has everywhere a regional distribution, and there exist large areas where the disease is unknown. It may also be prevalent on one farm and not on another adjoining, and some fields on an infected farm are worse than others. Within quite modern times the disease has almost entirely disappeared from certain parts of England. Moorland and permanent pastures are the worst infected places, cropping and draining of the land being apparently unfavourable to the organism. The majority of the cases are sporadic, but the bacilli from a carcase may infect other animals, though, if such cases do occur, they are very rare.

The disease is caused by a parasite that to a great extent is confined to the tissues at the site of the disease and not the blood stream. The parasite (a bacillus) is what is known as a facultative anærobic saprophyte, and its normal method of existence is as a soil bacterium.

The animals most susceptible to the disease are young cattle of from 6 to 24 months old, calves and animals over 3 years old rarely becoming infected. Sheep are also susceptible, and are affected at all ages. Like many other diseases, the individual susceptibility varies considerably, some animals apparently possessing considerable powers of resistance to the disease.

The natural method of infection has been much disputed, but probably the weight of opinion is in favour of the theory that this takes place by ingestion, and that some unknown circumstances are present to render the ingested spore infective.

The disease is rapid in its onslaught, often the first intimation of it being the finding of an animal dead. When a case is seen earlier than this, besides the ordinary symptoms of illness with a dejected appearance and trembling, the animal, if made to move, will exhibit lameness, or stiffness, and a swelling will be found, the hind quarters and the shoulder being the favourite sites for swelling, though it may occur on other portions of the body. This swelling at first is hot, painful and doughy, but it quickly becomes emphysematous, that is, blown up with gas; it crackles if you rub it, and sounds hollow if you tap it with your fingers; the skin over the swelling becomes painless, cold and leathery; in fact dead. After death, if one cuts into this swelling, one will find emphysema present, the centre of the swelling more or less dry, and a sour rancid odour, that is if decomposition has not yet set in. Cattle owners should implant these symptoms firmly in their memories to enable them to distinguish Quarter-evil from other diseases. The only two that are likely to be mistaken for it are anthrax and snake bites. In anthrax the blood is black and tarry looking and does not clot, and the spleen is always enlarged. In Quarter-evil the blood appears unaltered and clots normally, and the spleen is never enlarged. In snake bites there is always the hole caused by the snake's fangs, the swelling is not so large, it is not emphysematous, it has not got a rancid sour odour, it is not dry in the centre and the blood clots quickly and firmly.

The disease runs a very acute course, and very few infected animals recover. The carcase of an animal dead of the disease should, if possible, be burnt where it lies, and if it is buried it should be buried deep, covered with quicklime if at hand, and the grave fenced off to prevent animals subsequently grazing over the spot.

From the muscle of the infected portion of the animal a vaccine is prepared, and, in places where the disease is of annual occurrence, the young cattle are vaccinated (inoculated) every year, mostly in the spring. It is held that a week after inoculation the animals are immune to the disease, and this immunity lasts for nine to twelve months; on the other hand it is generally speaking not advisable to carry out vaccination on farms where the disease is only an occasional visitor.

At the beginning of this article is the statement "that some unknown circumstances are present to render this ingested spore infective." One of the conditions favourable to the development of Quarter-evil that has always been recognised obtains at the time when the grazing is conducive to the young animal rapidly improving in condition, or making blood as it is sometimes called. It has been also noted that the animals that were thriving best in the troop were invariably the first to succumb to the disease, and this also has been recorded in outbreaks in Rhodesia. To counteract this tendency, it was the old custom every spring to drench the young animals with Epsom salts, bleed them and put a seton of tape covered with some blistering ointment or a piece of tarred rope through the dewlap; some owners relying on one or other of these practices, others adopting all. These methods of preventive treatment are now scientifically regarded as so much witchcraft, but, like other forms of that art, are still practised to a greater or less extent. The treatment that is recommended for places that only occasionally get the disease is to keep the young stock in the spring, when the grass shoots and becomes plentiful, upon some high lying, rather poor pasture, and, if the disease breaks out, to move the kraal and feeding ground to a fresh portion of the farm. This frequently stops the disease at once.

The foregoing remarks, which apply broadly to the disease as it exists throughout the world, including Rhodesia, are based upon experience that has been gained during the time the disease has been present in this country.

The disease was first scientifically diagnosed in Rhodesia in 1911, when a few animals died from it at Redbank and others at Insiza; no more was heard about the disease until 1916, when it was reported to be very prevalent in the Tati Concessions adjoining Rhodesia. In December of that year cases of it occurred in the Plumtree district in Rhodesia, and from that time on further cases of it have occurred in the nature of a wave to the north and the east, until at the present time sporadic outbreaks of the disease occur in all parts of the Territory.

When the disease was first diagnosed it was noted that it was not recognised by the natives, and the conclusion was drawn that as the natives did not know the disease it had not existed in the country prior to 1911. This is probably incorrect, as odd cases had been noted by farmers who had had experience of the disease elsewhere. What I think is the true explanation is that prior to 1917 the disease was of infrequent occurrence in Rhodesia, and that the cases that did occur were not recognised as such, but usually attributed to snake-bite or other cause. The reason for the disease becoming prevalent from and since 1917 is of great scientific interest, but the fact that it has done so is the point that appeals to the stock-owner.

In Rhodesia it has been thought, and perhaps rightly so, that the disease has behaved in a somewhat different manner to what it has done in other parts of the world; for instance, that at least in the earlier outbreaks it assumed more the nature of a contagious than a sporadic disease, and that parts of the dead animal were more likely to convey the disease from place to place than had been thought to be the case in other countries. Also that a larger proportion of older and mature animals had been affected here than elsewhere, and in one or two other respects that the disease was somewhat different.

Cases can and have been stated in which the evidence appears to prove that the disease has been contracted by direct contagion; of course it is known the disease can be transmitted in this way. The only thing about it calling for comment was the apparently comparative frequency of this method of transmission, but the probability exists that many of these cases are simply coincidences.

In one locality two outbreaks of the disease existed at a distance of only between one and two miles apart; at one only sheep died from the disease, at the other only cattle died, although both classes of animals were present at both places. Such occurrences as well as mature animals dying from the disease have been recorded in other parts of the world, and because one has not heard of them it should not be assumed that because they have been seen in Rhodesia it makes the disease different to what it is elsewhere. On the other hand it would be equally wrong to assume that because the organism causing the disease behaves in a certain way in another country it is going to behave just the same in Rhodesia, or that the last scrap of knowledge about it has been obtained and no more is to be found out.

Present-day experience of the disease in those parts of the country in which it has been of annual occurrence apparently points to the fact that it is exhibiting to a greater extent those characters which are commonly associated with it, such as being worse in one locality or farm than in another, attacking only young animals, etc., and that the extraordinary characters are not so frequently manifested.

A question that has exercised the minds of cattle owners to a great extent has been whether they should vaccinate against the disease before it appeared amongst their stock or whether they should await its appearance? This question arises of course only when the disease has never been present on a farm, and while no hard and fast rule can be laid down to meet all cases, the weight of reason seems to be in favour of a cattle owner waiting for the disease to appear. The temperament of some men will not permit of this being done; they hear of their neighbours' losses and they feel they simply must do something to prevent a similar state of things happening in their own herd. Then there is the man who apparently is never happy unless he is "doctoring" in some way or another his animals; such an opportunity is too valuable to be lost and vaccination will be decided upon at once. The thinking man will consider a long time before he will initiate a vaccination policy, for the reason that it means quite a lot of hard work and expense according to the number of animals to be done, and if it should prove to be unnecessary the animals will be much better left alone. Last, but not least, if he starts vaccination he may have to continue it as a regular routine of his farming practice—a position that he has no desire to bring about. To sum up, a man who has never had the disease on his land, and consequently has not got to vaccinate his stock against it, is in a much better position that a man who has to do so, and he should not lightly assume that he must lose his favoured position and accept the other.

This question of vaccination before an outbreak of the disease occurs is also greatly influenced by the nature of the vaccine that is available for use and whether there is a possibility of the vaccine introducing the disease into a herd.

In Rhodesia we have tried several different vaccines with varying results. In some cases a certain vaccine has given excellent results; in others the same vaccine has not done nearly so well, but from the results obtained with different vaccines in different districts and throughout the country generally information has been gathered which should prove valuable when the time arrives—which it is hoped will not be very long distant—when vaccine will be manufactured in Rhodesia. In the meantime quarter-evil vaccine is stocked by the Veterinary Department and can be obtained at cost price from the various District Veterinary Surgeons, who are also in a position to advise as to the results obtained in their districts.

On farms where the disease has proved to be enzootic it has become customary to vaccinate the young stock every year, but on some farms it has been found by experience that the twelve month period is too long and the young stock are vaccinated every six months.

A curative serum is being imported by the Veterinary Department for the purpose of attempting to cure animals that are actually affected with the disease. It is not expected, owing to its cost, that this serum will be used to any great extent for common stock, but it should appeal to owners of pure-bred herds. By the time this article is in print it is hoped this serum will be in the hands of the District Veterinary Surgeons, from whom particulars as to cost, etc., may be obtained.

EXPLANATIONS.

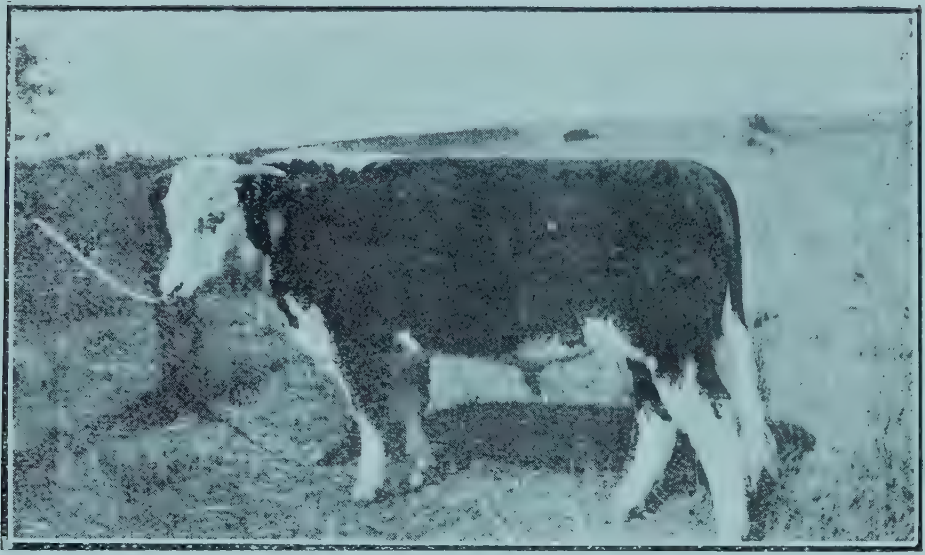
Sporadic: Occurring here and there.
Facultative: Capable of adapting itself.
Anærobic: Thriving without air or oxygen.
Saprophyte: Organism living upon dead animal or vegetable matter.
Enzootic: Occurring among animals in a particular locality.

The Salisbury Show.

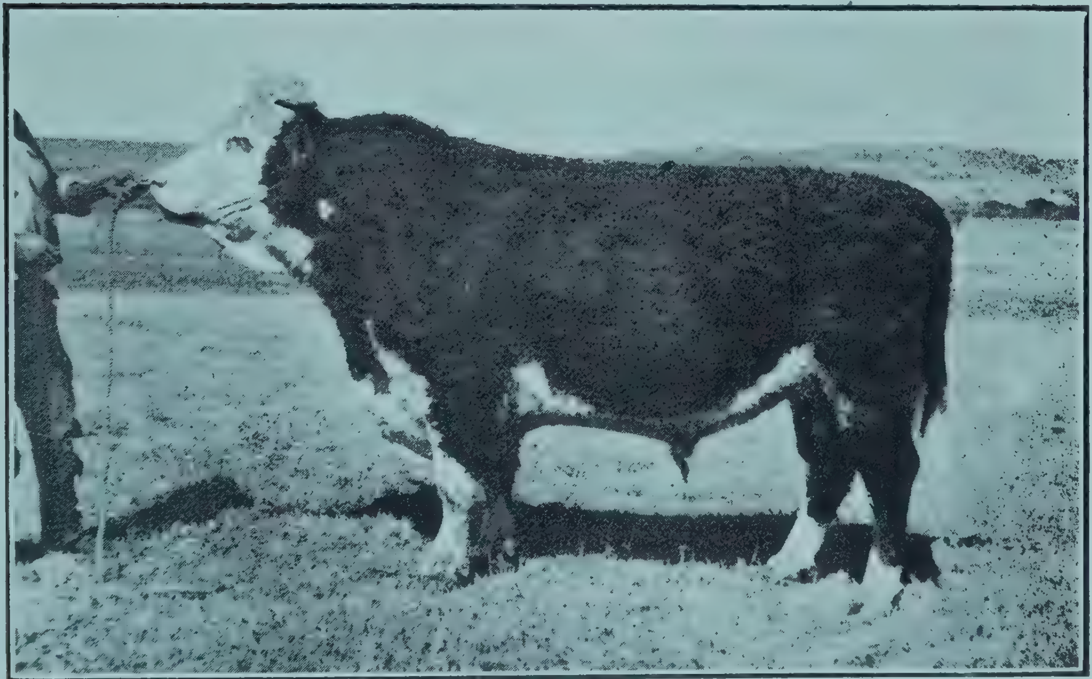
The nineteenth annual show of the Rhodesian Agricultural and Horticultural Society held at Salisbury on the 11th, 12th and 13th August may be regarded as the most successful show which has been held in the capital. The numbers and quality of the exhibits of cattle, maize and tobacco—our three main products—demonstrated in a convincing manner the progress which is being made by the pastoral and agricultural industries and afforded a very good indication of the potentialities of the country. Visitors to the show from outside the Territory were greatly impressed by the high standard reached, and the country will undoubtedly receive an excellent advertisement thereby.

In comparison to Bulawayo the show at Salisbury labours under obvious disadvantages as regards buildings, in regard to which the far-sighted policy of carrying out improvements in adverse conditions in Matabeleland is now reaping a rich reward. Money talks, and although the financial position of Salisbury is sound, the arrangements manifestly suffer from lack of capital expenditure. Time and effort may put this right. The farmer delivers the goods of admittedly high standard and takes away the prize money; the townsman puts in much time and work, and no doubt benefits indirectly, but without adequate accommodation the exhibits do not appear to the best advantage, and much of the labour is lost.

Mr. G. C. Woodforde's "Raithby Blenheim," 1920. Winner of 1,000 Guineas Trophy, Bulawayo, 1918 and 1919, and Milne Trophy, Salisbury, 1919 and 1920.



"Devonby Dogma," 13 months old. Champion Hereford bull, champion S.A. bred (all breeds), champion Rhodesian-bred (all breeds), reserve for 1,000 Guinea Trophy, Bulawayo Show, 1920. Bred by Mr. C. S. Jobling.



"Devonby Damocles" at 3 years old. Champion Hereford bull, Bulawayo, 1919; champion S.A.-bred bull (all breeds), Bulawayo, 1919; champion Rhodesian-bred bull, Bulawayo, 1919; third for 1,000 Guinea Trophy, Bulawayo, 1919; champion Hereford bull, Salisbury, 1920; champion Rhodesian-bred bull (all breeds), Salisbury, 1920; reserve for Milne Trophy, Salisbury, 1920. Bred by Mr. C. S. Jobling.

Salisbury Show, 1920. Parade of bulls.

Contributions have in the past been generous, particularly on the part of the mercantile community. It would be wise if such farmers as are now making good—and happily there are many such—would contribute freely to the expenses of the show, which is recognised to be so great a benefit to them.

In regard to shows the average standard in South Africa, due largely to an inordinate dependence upon grants-in-aid from Government, is much below that of Europe, America and Australia in respect of structural arrangements, fixtures and equipment. We all know our difficulties here, but the case made out by our societies for greater financial assistance from the farming community is certainly a strong one.

The third day of the show was entirely devoted, as was also the case last year, to lectures and demonstrations, which occupied the whole day from nine in the morning to five o'clock in the afternoon. In spite of the obvious indications of physical exhaustion manifested by some of the visitors, there was a keen interest taken in the various addresses arranged. More particularly was this the case at the cattle ring, where for three hours continuously there was a concourse of persons contemplating the cattle kindly brought out again by the exhibitors, discussing points and obtaining from the judges frank and clear expositions of the reasons actuating their judgments. Special recognition is due for their services in this connection to the cattle judges, Mr. N. Fleming from the Union, Mr. Bradshaw of Insiza and Mr. Barnett of Umvuma. Maize naturally was the subject of lectures and discussion, as were also the possibilities of other crops, our indigenous grasses and also our native forests. The facilities for these addresses and meetings are still somewhat primitive and leave much to be desired in the way of comfort and convenience, but the keen interest of those who attended was ample compensation to the lecturers for their efforts under unfavourable surroundings and conditions.

Cattle.—Long ere this the public will have been informed through the medium of the daily and weekly press of the details of the cattle exhibited and the prizes awarded. No good purpose will be served by repeating these details here; at the same time some general observations on the outstanding points of the cattle section will be of interest to our readers.

Possibly the feature which struck one most forcibly was the general all round excellence. This applied not only to the intrinsic merit of the animals, but to their feeding and general preparation as well. The Department of Agriculture has year by year in the past, through the pages of this *Journal*, endeavoured to point out the necessity of shewing cattle in good order. Whether or not the Department may claim that its efforts have aided in bringing about an improvement, it is certain that the day is now past when the exhibitor of cattle on the Salisbury show may hope for recognition unless he spends some time and intelligent thought on the selection and preparation of his animals.

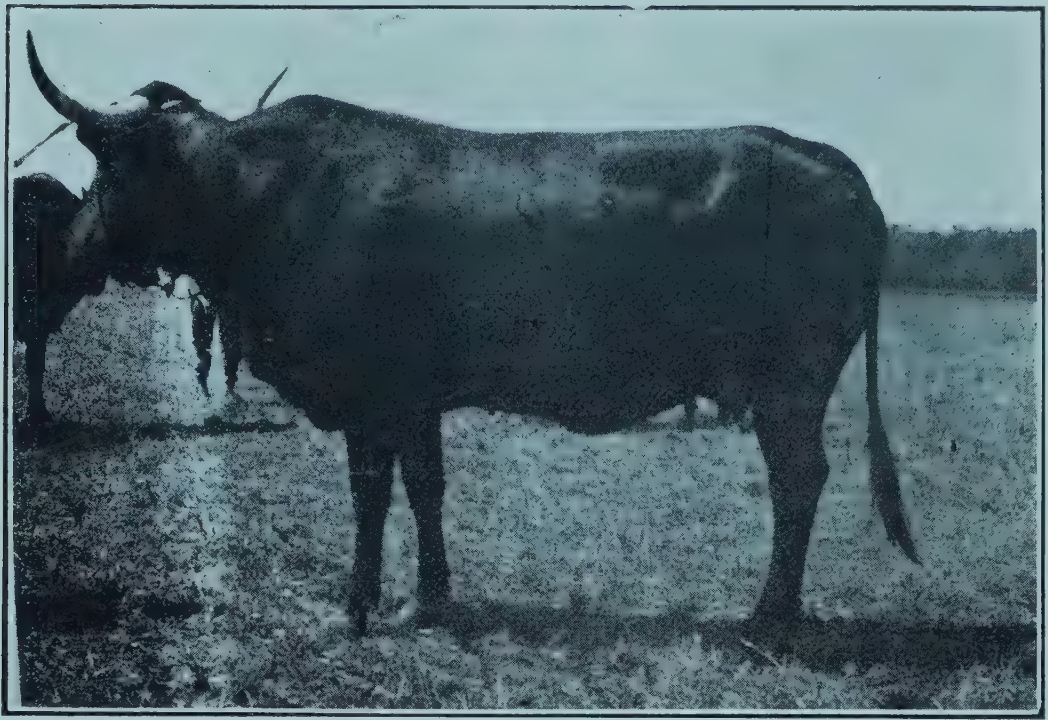
Such all round excellence may, on first thoughts, act as a deterrent to the would-be exhibitor of limited experience. On the other hand the success of the Rhodesian-bred animals shews that our more prominent breeders are not merely "cheque book farmers," but have acquired that skill in breeding and feeding and a knowledge of the peculiarities of this country which may be emulated by all intelligent stock men. There is no doubt that by following their good example the cattle community as a whole may be enabled to put Rhodesian cattle into that high place in the world's markets which we all feel sure they can and should occupy. The Rhodesian-bred animals caught the eye of the judges; in some cases notwithstanding the competition of really first-class imported stock. Mr. C. S. Jobling's "Devonby Damocles," for instance, was runner up for the Milne trophy to that great imported bull of Mr. Woodforde's, "Raithby Blenheim," and he beat Messrs. James and Worthington's Aberdeen Angus bull "Jacomo." "Devonby Damocles" also won the cup for the best Hereford bull on the show, for which his own son "Devonby Dogma" was runner up. In the Shorthorn and Aberdeen Angus classes the young stock up to two years old was largely bred by the owners, or at least was bred in Rhodesia. The majority of the Devon and Africander exhibits came under the same heading. Mr. H. P. Fynn was the only exhibitor of Africanders, but it is noteworthy that his very fine collection is practically the first of its kind that has ever been shewn at Salisbury, and is certainly the best Africander exhibit that has been put on the show by one breeder. Frieslands were not a strong class, but the few animals exhibited were in very fair order. Dairy cattle as a whole were rather conspicuous by their absence, although some good dual purpose animals were amongst the Shorthorns, and Mr. O'Keefe had a couple of good South Devons. We feel that the day cannot be far distant when the breeder of really good dairy cattle will be able to sell them "like hot cakes," and we should like to see more interest taken in the dairy classes. To the breeder of dairy bulls the show ring is no less valuable as a means of advertisement than it is to the breeders of beef cattle, and to win or be well placed with a milch cow in a publicly conducted milking test means a great deal more on the price of her bull calves than the extra cost of preparing for the show.

We are able whole-heartedly to congratulate the Rhodesian Agricultural and Horticultural Society and the farming community on the great strides which have been made in the direction of making this meeting one of supreme importance to cattle men, but we should like to see more dairy cattle, more slaughter cattle, more pigs, and at least some sheep. As time goes on the dairyman and mixed farmer must become more and more numerous, and the breeder who can get first in the field with the class of stock required by the mixed farmer will undoubtedly be well repaid.

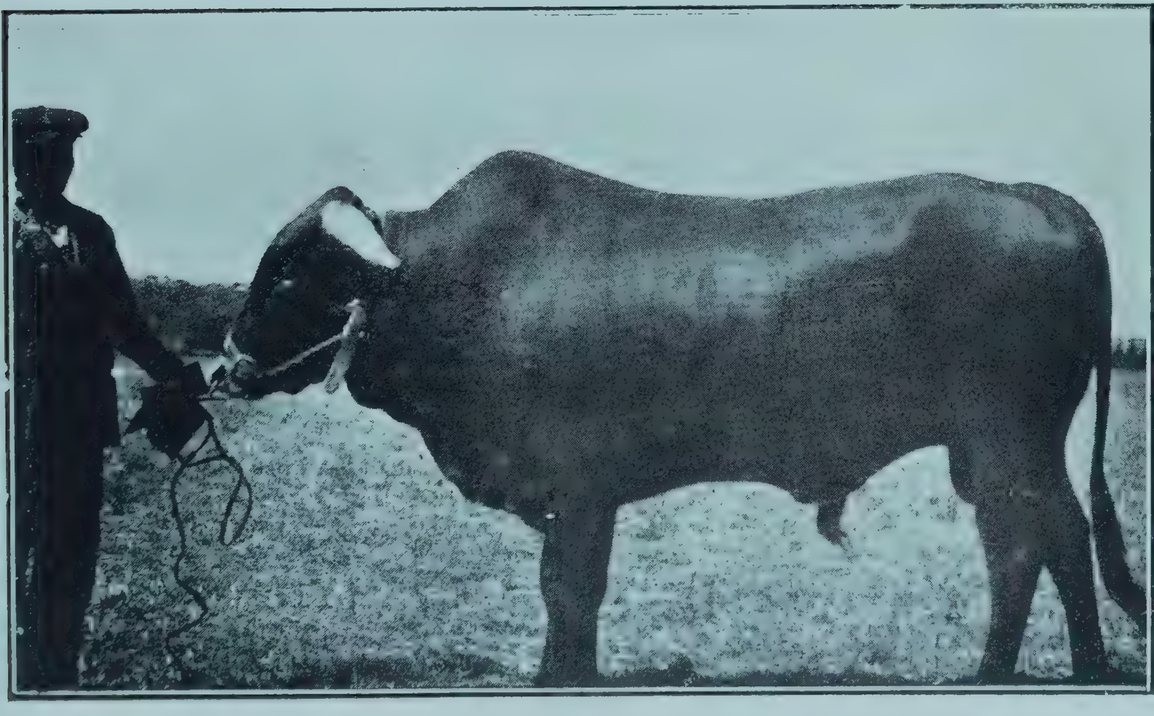
The following table shews the result of the milking competition:—

"Devonby Dryad II." at 2 years and 10 months old. Champion Hereford female, Bulawayo; champion Rhodesian-bred female (all breeds), Bulawayo, 1918, 1919 and 1920; champion Hereford female, Salisbury, 1919; champion Rhodesian-bred female (all breeds), Salisbury, 1919; champion Rhodesian-bred female (all breeds), Salisbury, 1920. Bred by Mr. C. S. Jobling.

"Devonby Diadem," 18 months old. First prize yearling heifer, Salisbury, 1920; second prize yearling heifer, Bulawayo, 1920. Bred by Mr. C. S. Jobling.



"Bembesi Queen." Champion, Bulawayo Show, 1918, 1919 and 1920; champion, Salisbury Show, 1920. Bred by Mr. H. P. Fynn.



"Rooi Gras." Champion, Bulawayo and Salisbury Shows, 1920. Bred by Mr. H. P. Fynn.

MILKING COMPETITION, SALISBURY SHOW, 1920.

Catalogue No.	Time of milking.	Total lactation days.	Pounds of milk.	Specific gravity at 60° F.	Percentage of butter fat.	Percentage of solids not fat.	Pounds of fat.	Pounds of solids not fat.	Points for lactation.	Points for quantity.	Points for butter fat.	Points for solids not fat.	Total points.	Deduction for fat.	Deduction for solids not fat.	Corrected points.	Grand total points.	Name of owner.
160	7 a.m.	42	13·1	1·027	3·5	7·6	·47	1·0	·2	13·1	9·4	4·0	26·7	...	10	16.7	25·9	2nd.—J. S. Struthers
	5 p.m.	...	9·7	1·026	3·4	7.4	·33	·72	...	9·7	6·6	2·9	19·2	...	10	9·2		
161	7 a.m.	37	11·2	1·031	3·4	8·6	·38	·96	...	11·2	7·6	3·8	22·6	...	...	22.6	39·9	1st.—J. S. Struthers
	5 p.m.	...	8·8	1·030	3·2	8·3	·28	·73	...	8·8	5·6	2·9	17·3	...	...	17·3		

Whilst the performance of the cows entered for the competition is by no means record-breaking, yet Mr. Struthers deserves to be congratulated on his initiative and pluck in bringing his cattle so far by road and rail to Salisbury. It is to be hoped that the splendid prizes offered by the Salisbury Show Committee will tempt farmers and dairymen to emulate his example at future shows. A great deal can be learnt regarding the feeding and treatment of dairy stock from such competitions, and they form an interesting and well contested feature at all the shows in the Union.

Maize.—It is safe to say that the large maize hall presented one of the finest and most unique sights ever seen at any agricultural show. The hall measures 110 feet by 50 feet, and from end to end stretched five two-sided stands of maize exhibits representing the two great types of flat white maize now grown in the country. Rhodesia is remarkable for the fact that nothing but white maize is grown on a commercial scale, and it is pleasing to note that the presence of a yellow strain amongst the exhibits was in almost all cases remarkable by its absence. Hickory King, at present the more widely grown variety, was naturally the more strongly represented, there being 21 entries in the 500 cob class as against nine in the corresponding Salisbury White class and three in the 500 Louisiana class. It may safely be said that the winning exhibits of all three classes were the finest representatives of their respective types ever seen in Rhodesia, while throughout the whole show the standard of maize was extraordinarily high, and in many instances considerable difficulty was experienced by the judges in deciding on the order of merit. Mr. George Rattray's Hickory exhibit which won premier place in its class and championship for the best 500 ear exhibit on the show was truly magnificent, and our visiting judges from Natal freely expressed the opinion that never in their experience had they seen any Hickory King to equal it.

Salisbury White, in which the premier honours in the 500 ear class went to Mr. Charles Southey of Concession, shewed a very marked improvement over previous years both in respect of quality and uniformity, and again our judges were much impressed with the possibilities of this variety. As is to be expected with a recently evolved type, uniformity was not so well marked as with Hickory King, but a distinct advance has been made, and if in their future selections the supporters of this breed will adhere to the type considered most desirable by the judges, there seems good prospect of establishing Salisbury White on a sound foundation.

Mr. George Duthie's exhibit of 500 ears of Louisiana Hickory, though not meeting great competition, well deserved its premier honour. It had been beautifully selected and excellently staged, and this breed will undoubtedly shew even further improvement during the next two or three years.

A noticeable feature was the considerable number of entries from districts other than Salisbury, Mazoe, Lomagundi and Enterprise, and the quality of these both in Hickorys and Salisbury White was a clear indication of the future development awaiting maize growers in many of these districts. Mr. T. D. McLean of Odzi scored numerous successes

A section of the maize exhibits, Salisbury Show. [Photo by D. Carson, Salisbury.

with Salisbury White, and secured the cup awarded the winner of the greatest number of points in any one breed, while the Makwiro and Inyazura districts were well represented by Mr. E. J. Smith and Mr. H. Curling respectively.

In regard to the 10 cob class, competition was extremely keen, and here the championship was awarded to Mr. D. W. Bean of Shamva for his ten beautiful cobs of Salisbury White, which the judges considered one of the most faultless ten cob exhibits they had ever seen. Mr. Bean is to be the more congratulated in that this is the first year that he has exhibited, and that he had received no special advice as regards the type of ear to select. The quality of his 500 ear exhibit in the same breed was on the whole good, but was unplaced owing to lack of uniformity. In the single ear class competition was again very keen, there being in all 72 entries. The championship here was awarded as last year to Mrs. Wilson, who scored with a very perfect 8-row Hickory cob. Space does not permit of our referring in greater detail to the numerous prize winners, but without undue flattery we may safely say that there was not a maize exhibit of poor quality on the whole show, and considering the total number of ears exhibited and the quality, no finer display of large flat white maize has been held anywhere in the world.

Tobacco.—The space allowed for the tobacco section was far short of the requirements, and the excellent exhibits of leaf could not, therefore, be staged to advantage. In addition to the lack of space, the room in which the tobacco was displayed was badly lighted, so that judging was rendered very difficult.

The farm graded and baled tobacco was a very gratifying feature of the exhibits. The grading and baling were well done and demonstrated that these operations can be successfully carried out on the farm if the growers will only set themselves to the task. The first prize for the best bale of 200 pounds of Virginia cigarette tobacco was won by Mr. E. M. Petreas of Makoni district. Messrs. Shone and Hunter of Lomagundi district were second in this class, with Mr. Trevor Fletcher of Hartley district a very close third. There were eleven exhibitors in this class, and the competition was very keen.

In the class for the best 10 pounds of bright cigarette leaf the competition was exceedingly keen, and all the exhibits were of excellent quality. The premier honours in this class went to Messrs. Shone and Hunter, with the Mazoe Tobacco Estate second and Mr. Trevor Fletcher third. For the best assortment of Virginia leaf Mr. Trevor Fletcher won first place with a very fine range of leaf, and the second prize went to the Mazoe Tobacco Estate. In the class for the best exhibit of Virginia leaf produced from locally-grown seed Mr. Trevor Fletcher won first honours, and Mr. A. V. Williams was awarded second place.

In the pipe tobacco classes, the first prize for dark pipe leaf went to Mr. A. V. Johnson, with Mr. Trevor Fletcher second and Mr. W. H. Watson third. For medium pipe leaf Mr. Trevor Fletcher was awarded first prize, Mr. A. V. Johnson second and the Retreat Farming Syndicate third. For light pipe tobacco, the Retreat Farming Syndicate was first, with Messrs. Shone and Hunter second.

The Safco trophy was won by Mr. E. M. Petreas with his splendid exhibit of 200 pounds of Virginia cigarette leaf, which was of exceptional quality. The silver cup, presented by the Bechuanaland Trading Association, was awarded to Mr. Trevor Fletcher, who, on points awarded, was the most successful exhibitor in the tobacco section. The same exhibitor also won the silver cup presented by Messrs. Wm. Bain and Co., Ltd., as well as the cash prize of £10 10s. presented by Messrs. Stewarts and Lloyds (S.A.), Ltd.

The exhibits of Turkish tobacco were disappointing. Taken as a whole, the exhibits of Virginia tobacco were probably the best ever staged in South Africa.

Cotton.—Considering that this crop is only just becoming established, the cotton exhibits made a wonderful display. There were nineteen entries in the cotton section, and competition in both classes was exceedingly keen. For the best 50 pounds of Bancroft seed cotton, the Mazoe Estate of the British South Africa Company won first place, with Messrs. Mossop Bros. of Glendale second. Both exhibits were of excellent quality, and the first place was won on very fine points. Some of the other exhibits in this class contained small amounts of stained cotton, which, although of equal commercial value, did not shew to the best advantage.

The cotton collections made a striking display, and were of great educational value. In this class Mrs. H. M. Mackendrick of Bindura won first honours, with the B.S.A. Co., Mazoe Estate, second, and Mr. J. H. Farmer of Bindura third.

The cotton section was a striking proof that cotton can be successfully grown in Southern Rhodesia, and with the prices prevailing at present this crop should make rapid progress.

Produce.—A feature of the produce section was the numerous entries in ground nuts and sunflower seed, which afforded keen competition. Mr. E. S. White was first for sunflower (black). Mrs. Wilson's ground nuts were of excellent quality and were an easy first. The bean exhibits were exceptionally good. It is encouraging to note that good white stingless velvet bean samples were shewn, it being one of the most valuable rotation crops following maize. There were surprisingly few entries in the potato classes in view of the big crop produced in the Territory; two exhibits were disqualified for being infected with tuber moth and scale. The wheat staged was of good quality but badly cleaned. In regard to kaffir corn, some very good grain was shewn. The entries in the hay and forage classes were weak. An excellent collection of stock feeds (chiefly roots) grown by Mr. G. Duthie was awarded a first prize.

Dairy Produce.—There were only two classes for butter, and for one of these, best 25 lbs. salt butter, there was only one entry, by Mrs. R. Reimer. This was well made, but a little deficient in flavour, which is only to be expected with butter which is kept in storage for six weeks. For the class for the best 4 lbs. butter in 1 lb. pats there were ten entries. The winning exhibit, sent in by Mrs. Reimer, was of very fine flavour and well made. The exhibit by Mr. C. C. Macarthur ran the winner very close.

It is to be hoped that with the development of creameries in Rhodesia the Show Committee will consider the inclusion of creamery classes for butter in the next prize list.

In the cheese classes Mrs. C. A. Birch of Francistown exhibited some cheese in the Cheddar class, not less than 60 lbs. It was of excellent quality and beautifully finished, and as good a sample as could be found at any of the shows in the Union. The only exhibit of Gouda cheese, not less than 60 lbs., was by Mr. B. J. E. Pretorius. This was rather deficient in quality, due to over scalding and cutting the curd too fine.

The chief fault in Rhodesian cheeses is weak body. Cheese which is not firmed sufficiently during the process of scalding will not stand long journeys during hot weather, and as we are looking to the Congo as a market for our surplus cheese, makers should bear this in mind. Weak-bodied cheese is apt to "blow" and develop a butter flavour whilst *en route* to its destination.

Poultry.—The poultry shewed a very marked advance both in quality and numbers on those at previous shows. With a few exceptions the quality was excellent and the birds well put on. Some birds looked dirty and out of condition, but in the majority of cases this was due to transit by rail and dusty roads.

The utility side, as represented by birds judged according to their laying points, was excellent, and shewed a very great improvement on former years. Dealing with these first, the class for six birds judged on their laying merits produced a very good entry, and several breeds were represented, White Leghorns not predominating as is usually the case. The class for two birds, judged on the same points, was also good.

Eggs, of which there were 35 entries (usually at shows even in the Union there are anything from six to eighteen entries), were excellent.

They were fresh, of good size, clean, and well graded for size, shape and all points except colour, that is in the brown and tinted varieties. The grading of the white was good. A brown must be a decided darkish brown ; a tint anything between white and brown. All exhibitors are to be congratulated on the exhibits, which were very different indeed to what was seen on shows here two years ago.

The class for 30 dozen eggs packed for export was good in quality but disappointing in number of entries, there being only two. This is a class which no doubt will be better filled in future years.

Turkeys, especially the Toms, were a revelation. The number of entries was good, but the surprise was in the quality, which was very fine indeed. All were good, and it was quite a difficult task to allot first, second and third awards. It was very noticeable that all exhibitors knew the good and most important points of a turkey, and each exhibit was well selected. There were four claimants for the first prize turkey Tom, and on being put up to auction it fetched £13 10s., and from the point of view of the stock he will produce, if well mated, was well worth it. The turkey hens shewed an improvement on former years, but there is still room for further improvement in size.

Several breeds not hitherto seen at the Salisbury Poultry Show were staged, among them Speckled Sussex and White Rocks, two excellent breeds and most suitable for the farmer. They created a large amount of interest, and it is to be hoped that they will be universally kept. Rhode Island Reds, a very popular breed, and deservedly so, held the pride of place for numbers, and their quality was excellent; this is another good farmer's fowl. Orpingtons were represented by the white, black and buff varieties, of which the first-mentioned excelled in number and quality. The Indian Game hens and pullets were good, but the cocks and cockerels lacked condition. Barred Plymouth Rocks were few in number, but good in quality.

Turning to the light breeds, there were not as many Utility White Leghorns as in former years, which is an encouraging sign from one point of view, viz., that a greater variety of breeds is now being kept. They were good in parts, but more attention should be paid to condition in this breed. There were some very good exhibits; on the other hand there were some rather poor ones. Black Leghorns were fair; Minorcas were good, as also were Anconas, of which latter breed there was quite an appreciable number of entries. Campines, an excellent breed and of a very striking appearance, were few in numbers but good in quality. The class for Brown Leghorns produced some very good birds. This again is a good breed, easy to produce as a good layer, but difficult as a show bird. Ducks were conspicuous by the absence of Indian Runners, which was surprising, as this is a favourite breed of ducks. At the Bulawayo show they predominated, and there was an excellent entry both of the fawn and white varieties. Pekins were very good, but the best exhibits in ducks were four Rouens (two drakes and two ducks), which were very fine examples of this breed. There was one Bantam (an O. E. Game) only, but an excellent little bird.

The class for poultry foods grown by farmers was very disappointing, there being only one exhibitor with an entry in each class: (1) 50 lbs. mixed grain suitable for poultry feeding, (2) 50 lbs. of one grain. These classes were initiated with the object of encouraging farmers to grow crops suitable for poultry feeding and do away with the necessity of importing, and make Rhodesia self-sustaining in this respect; but so far neither the farmers nor poultry keepers with sufficient land to grow small crops have responded.

The class for home-made appliances brought no entries; again a disappointment. Is it lack of initiative, or slackness, or what? The class too for birds exhibited by children under 16 brought no entries. This is a class inaugurated to encourage the rising generation, especially farmers' sons and daughters, who will ultimately become farmers or farmers' wives. This class we sincerely hope will next year be well filled.

In order that the public should have access to the poultry hall on the opening day of the show judging was carried out the day before, and all prize cards were up on the morning of the first day. Judging poultry with the public present is impossible; to judge 500 birds and examine each one individually as in this case means a whole day's hard and constant work without any interruption or distracting elements.

Sinoia Show.

The annual farmers' gathering at Sinoia has now blossomed into what may fairly be described as the Lomagundi district agricultural show. This happy result is an indication of the progress of the district and a good augury for the future. The exhibition of stock and produce at the show held on the 29th and 30th July was in all respects creditable. Lomagundi is one of the younger agricultural districts of Rhodesia, but it is advancing rapidly. Undoubtedly it is specially rich in minerals, and its native timber is a factor of much potential importance. Arable farming affords good returns, and a wider variety of crops can be grown than in many other parts of the country. In consequence of these resources the district is rapidly filling up with a desirable class of settler both from the south and from overseas. The local show and the social gatherings connected with it serve a useful purpose in bringing together far scattered inhabitants with common interests, and new and old settlers with ideas to exchange. Many, unable or unwilling to attend the larger shows at distant centres, yet come in to exhibit at their district show, and if sufficiently successful are encouraged to send their exhibits to the larger shows.

In this respect the recent show at Sinoia was fixed too late, as prize winners could not enter for Salisbury, and this is a matter which might well be remedied next year. The show was an entire success; it was instructive and helpful to the farmers, and demonstrated the potentialities of Lomagundi to all interested in the welfare of that part of Rhodesia.

The Treatment of Fly-struck Cattle.

By H. E. Hornby, M.R.C.V.S.,
Government Veterinary Surgeon, Northern Rhodesia.

During the six years previous to 1919 I treated 700 large animals affected with trypanosomiasis. Some conclusions arrived at in consequence were set forth in the *Veterinary Journal* of March, 1919, as follows:—

(1) On account of its solubility, low toxicity and high trypanocidal action, tartar emetic is probably the most valuable drug available for use on a large scale in the treatment of domestic animals affected with trypanosomiasis. Its cheapness is also a point in its favour.

(2) It can be administered intramuscularly or intravenously, but the latter method is the better.

(3) One gramme every third day is the maximum that can be administered over a long period to even the largest domestic animals, but the same amount every fifth day is well tolerated by adult bovines and equines.

(4) Administered *secundum artem* it is capable of effecting cures in domestic animals infected with certain strains of *T. vivax* and *T. congolense.* On the other hand, one frequently encounters resistant strains of the same parasites.

(5) Nevertheless were it possible to give the patient a course of injections extending over a long period, I believe that most cases of disease due to these two species of trypanosomes could be cured. Sometimes a single injection will bring about this result.

(6) Tartar emetic shares with all other drugs which have been tried the property of being practically useless in the curative treatment of *T. brucei* infection of equines. Its sole value in connection with that form of trypanosomiasis is palliative when given regularly to animals working in "fly."

Early last year I returned to my district in N.E. Rhodesia, and I determined to put to the test the belief expressed in conclusion (5) above. Something had to be done to combat the disease in the Fort Jameson district, because with fly belts adjoining half its perimeter the initial cause of infection was always present, and, once introduced into a herd, mechanical infection by flies other than tsetse quickly spread the disease. Let me give two illustrations:—

(a) Msipazi Farm is ten miles from the nearest fly-belt and has been free from trypanosomiasis during the six years the previous owner was on it. On 1st December, 1919, the present occupier had a herd of 31 healthy adult cattle. A beast became infected somehow or other and died on 5th January of this year. By 17th January five more were ill and their blood rich in trypanosomes. By 10th February three more had died and 11 more were sick. On 26th February only four out of the original 31 remained apparently sound.

(b) There is one small fly-belt on the wagon road between Missale and Tete, and with careful conducting not more than 2 per cent. of cattle are struck while passing through it. Yet on account of the disease so introduced there died between 1st January and 30th April of last year 250 out of 500 oxen, and, when I saw the survivors at the beginning of May, there were only 48 of them which were apparently unaffected.

Under these circumstances one cannot wait until perfection in treatment has been attained; it is necessary to make the most of existing knowledge.

As most of my work on treatment has been done in connection with the above-mentioned transport oxen, I shall give further particulars of what happened to them subsequent to 1st May, 1919.

On that date there were 253 oxen at Missale, of which only 48 were apparently sound; the remainder shewed symptoms of tsetse fly disease, many being too weak for hope of recovery to be entertained. I commenced to treat them at once, the system adopted being to give *a course of six intravenous injections, each of 25 c.cs. of a 4 per cent. solution of tartar emetic, at intervals of five days.* Subsequently, when it was found that some of the treated animals either did not pick up rapidly or else relapsed to the disease (or became re-infected), a second or third course of injections was given.

By 27th May there were left 236; of which 86 were sufficiently strong to work, and, accordingly, set off with wagons to Tete, 200 miles away. Of these four spans 82 oxen completed the double journey, although some were re-treated on the road.

At the end of July there were 216 alive, and on 21st August 134 of these started off in front of heavy loads to do the double journey, and 130 of them returned.

On 14th October 164 left for Tete, leaving 40 behind for further treatment. All of the 164 completed the 400 miles before the end of November.

On 18th December there still remained 200, of which only 13 required injections. On that date 70, in splendid condition, set off with wagons, and 68 returned.

With the commencement of the rainy season biting flies other than tsetse became numerous, and so it was impossible to say if the animals which again developed symptoms of "fly" disease had relapsed or were re-infected.

On 20th February, 1920, there were alive 180 of the original 253, and the general condition of the herd was considerably better than it was ten months before, although during that time most of the oxen had pulled loads over distances varying from 800 to 1,200 miles.

From this account alone we can conclude that, under some circumstances, treatment is of value. To get a more accurate estimate of what this value is I have kept a record of the result of the treatment of fourteen typical cases, selected only on account of the facts that trypanosomes were present in their blood at the commencement of the course of treatment, and that they have been under observation for not less than three months afterwards. I append a table shewing this record.

When, on the table, I describe an animal as "cured" it is necessary to define what I mean. I mean the restoration to their normal physiological condition and function of those organs which were deranged by the disease. An animal cured is free from fever and steadily puts on weight until the normal is reached. A cured ox can work, a bull can serve, and a cow bear and rear calves. If, however, all the trypanosomes in the body are not destroyed, but merely repressed, then the cure must be called *temporary*, because sooner or later the germs will again get the upper hand and the beast relapse. None of the cases tabulated has been under observation long enough for me to say with confidence that it has been permanently cured, and so it is safer to assume that it is liable to relapse. On the other hand those described as "cured" and "relapsed" may possibly have been re-infected, because after a beast has been well for some months it is frequently impossible to say whether a recurrence of the disease is due to relapse or re-infection. I have known cows cured in 1914 to bear three or four calves and then to die of the disease in 1919 or 1920. Although such extreme cases are probably re-infections, yet after what period of time a cured beast is safe from relapse remains to be worked out.

Apparently no high degree of immunity results from cure, because if such a beast will relapse to its own strain of parasite it is reasonable to suppose that it will not offer much resistance to another strain of the same species of trypanosome. I know oxen which have been treated four times during the past six years, each time with favourable results, although the period of usefulness resulting from each cure has lasted only from three months to two years.

Even if we accept as a premise that the cure resulting from a course of six injections is only temporary, we must nevertheless admit that the treatment has been of considerable value to settlers living in the neighbourhood of "fly." I should never recommend a man to treat an isolated case if he thought the remainder of his herd was unaffected; the risk of relapse and the animal being a source of danger to others is too great. It is when a number are infected and slaughter a too expensive procedure that I recommend treatment. Take the case of the Msipazi farm mentioned above, where 27 out of 31 were infected. A policy of slaughter means the extermination of the herd. As it is, the owner is treating all the survivors, and I am confident that he will have the use of many of them again; in fact, several are already at work.

Another example of the advantage of treatment is the Chadzombe herd. The disease was introduced early in 1919 by a bought heifer, and during the subsequent eight months 40 animals became infected. The owner started a sick herd and commenced treatment. By January of this year there had been seven deaths attributable to the disease, there was a sick herd of nine under treatment, while the remainder, including the original cause of the trouble, were normal in appearance and function.

At Mumbwi, which is so close to "fly" that odd cases of direct infection occur each year, a herd of a hundred animals was kept in comparative safety during the whole of 1919 by rigorous inspection, and treatment of all animals suspected of possibly harbouring trypanosomes. About six were picked out and treated during the year, of which, so far, only two have relapsed.

At Phœnix Estate, last June, I picked out three fly-struck cattle, which were treated and recovered. Since then one other beast has shewn symptoms of "fly" and been destroyed, and the herd when seen in January of this year was a very healthy one.

I could continue to give instances, but probably even more convincing is the statement that more and more local stockowners ask me to provide them with syringes, powders and particulars of how to use them; on account, they say, of the feeling of security such possession gives them. I hope time will not shew this sense of security to be false. We still look upon an outbreak of trypanosomiasis as a very serious matter, but not as necessarily disastrous.

This, then, is my advice to one whose herd is in danger of infection by trypanosomes:—

Provide yourselves with a syringe, tartar emetic powders and knowledge of how to use them. Keep a strict watch over your herd, and, on the first suspicion of the disease making its appearance, inject the affected animal. Do not wait to be sure that it is infected; if you give the injections carefully you will do no harm even if your diagnosis is at fault; the only ill result which follows a course of correctly given injections is a temporary fatty degeneration of the viscera; a cow is not even put off her milk. It is true that occasionally a beast collapses and dies immediately after receiving an injection, but such cases do not amount to 1 per cent. of those treated. After giving an injection make a mark on the horn with a file, and when six injections, as shewn by six file marks, have been given, discontinue treatment for three weeks. If successful the animal will commence to pick up from the date of the last injection and will soon present an appearance similar to that of others in the herd. Even so it is advisable to give an injection once a month for the next six months. Should it not pick up rapidly, then destroy it if it is the only one; if there are more than one they can form a sick herd, to be kept apart from the healthy animals, re-injected and disposed of to the butcher when fat. Good feeding is an essential part of the treatment. While undergoing the course of injections a beast is not dangerous to others, nor is it so long as it is undoubtedly picking up or looking well. Be always on the lookout for relapses, though; they can be recognised by a recurrence of the original symptoms. Until we know whether by treatment with tartar emetic we are able to bring about a permanent cure it is advisable to make use of any opportunity which may arise for the profitable disposal to the butcher of any cured animal. At the present time it is dishonest to sell for any purpose other than immediate slaughter a beast treated and recovered, unless you inform the buyer of the risk he takes of introducing a serious disease into his herd.

Transport riders should remember that the conditions under which they work are conducive to the mechanical spread of the disease among their oxen; they cannot, therefore, be too vigilant in their watch for symptoms nor too hasty in commencing the treatment of suspicious cases. An injected beast can work the same day; in fact, on the Tete road the native drivers are the first to come and ask the conductor to give a beast an injection "to make it pull."

The intravenous injection of an irritant drug is not a particularly simple operation. The greatest care and cleanliness must be observed if one is going to give a course of six injections at the end of which the neck of the patient is to be unswollen. It is not, however, beyond the ability of any farmer or conductor to learn from one who is already an expert at the task.

TABLE SHEWING THE RESULT OF THE TREATMENT OF FOURTEEN FLY-STRUCK CATTLE.

No. of case.	Description.	Condition at commencement of treatment.	Species of trypanosome.	Treatment commenced.	Courses of injection.	Last seen.	Condition then.	Further remarks.	Apparent result.
1	Black Angoni ox	Poor	T.c.	4-6-19	One	13 3-20	Poor	Became fat; worked from August to February; relapsed	Temporary cure
2	Half-bred Hereford bull	Fair	T.c.	5-6-19	Incomplete one	...	...		Died
3	Quarter-bred ox	Poor	T.c.	27-6-19	One	23-4-20	Fat		Cure
4	Roan Angoni ox	Poor	T.c.	25-8-19	Incomplete one	...	...		Destroyed
5	Quarter-bred ox	Fair	T.c.	25-8-19	One	23-2-20	Fat	Working	Cure
6	Quarter-bred ox	Fair	T.c.	16-10-19	One	27-2-20	Good	Working	Cure
7	Quarter-bred bull	Poor	T.v.	30-6-19	One	21 1-20	Fat	Serving	Cure
8	Brown Angoni ox	Very poor	T.c.	18-9-19	Two	10-4-20	Fair	Became fat; relapsed, but again responded to treatment	Temporary cure
9	Black Mashona ox	Fair	T.v.	24-9-19	Two	10-4-20	Fair	Recovered; relapsed after pulling 300 miles, but again responded to treatment	Temporary cure
10	Brindled quarter-bred ox	Very poor	T.c.	17-9 19	One	10-4-20	Good	Working	Cure
11	Black Mashona ox	Fair	Both	18-9-19	Two	10-4-20	Fair	Never picked up well, though capable of light work	Partial cure
12	Roan quarter-bred ox	Fair	T.v.	16-10-19	Two	10-4-20	Poor	Relapsed after several weeks' work	Partial cure
13	Red Angoni ox	Fair	T.c.	16-10-19	Two	10-4-20	Fair	Working well	Cure
14	Roan Angoni ox	Fair	T.c.	16-10-19	Two	10-4-20	Poor	Never picked up well	Destroyed

New Crops for Rhodesia.

REPORT ON SOME OF THE EXPERIMENTS CONDUCTED AT THE AGRICULTURAL EXPERIMENT STATION, SALISBURY, AND THE GWEBI FARM, 1919-20.

By J. A. T. WALTERS, B.A., Agriculturist.

Trials with Fodder Crops.—The provision of winter fodder for the constantly increasing number of well-bred cattle in this Territory is receiving greater attention than formerly, with the result that the stock-carrying capacity of our farms has been vastly improved. Without such a provision the number of cattle kept on any farm will depend upon the natural grazing afforded during the dry season. With artificial fodder the farmer may be said to prolong his summer conditions far into the dry season. It is not proposed to deal here with succulent foodstuffs such as mangels, majorda melons, pumpkins or ensilage, which are often produced in a high degree of perfection in this Territory. It is intended rather to indicate the results of experiments conducted at the Agricultural Experiment Station, Salisbury, and the Gwebi Experiment Farm in the production of dry fodder. It may be stated frankly at the outset that good hay is rarely met with in this country, a state of things due partly to unfavourable climatic conditions, but principally to a lack of interest in the matter, as the provision of good hay is not regarded as of such vital importance as it is in European countries, where cattle are kept indoors for a great part of the winter. None the less, as the production of this class of foodstuff is on the increase, it will be well to indicate the characteristics that mark the well prepared product. Good hay is marked in the first place by colour due to the preservation of the green chlorophyll in the plant. Over-exposure to the sun will cause the destruction of this matter and result in undue bleaching. This is a very prevalent fault in this country of abundant sunshine and can be remedied by a quicker handling of the hay when cut and gathering it into cocks without loss of time. In the second place good hay has a pleasant aroma due partly to the fermentation that takes place when hay is not allowed to dry out excessively before being stacked. Lastly, good hay retains the leaves and finer parts, the absence of which is a very marked fault in the case of leguminous crops such as velvet bean and lucerne hay when carelessly prepared.

The experiments referred to dealt principally with the increase in

Plate I. Kudzu Vine (*Pueraria thumbergiana*). Agricultural Experiment Station, Salisbury, 1919-1920.

Plate II. Kherson's 60-day oat, summer grown, 1919-1920. Agricultural Experiment Station, Salisbury.

Plate III. Niger oil crop.

the total amount of hay possible by different methods of sowing and cropping, and the most striking fact was the improvement in yield obtained by a mixture of the hay crops. The advantage to be obtained from a mixture might be explained by the fact that different plants have different root systems, some feeding deep, others feeding nearer the surface, the different classes also requiring different food materials from the soil, thus interfering but little with each other's development. At the same time a mixture, provided the constituents are equally good, is probably preferred by the animal to a pure crop and usually improves the balance of the ration. Taking the whole of the results from all cultivated hay crops under observation for the last three years, and excluding veld hay, we have an average for pure stands of hay of a weight of one and a half tons, or to be precise, of 2,996 lbs. per acre. For this last season only, the average had dropped to 2,345 lbs. of hay per acre in spite of the favourable rains and of one exceptionally fine crop of teff hay which amounted to 4,441 lbs. per acre. Taking the crops separately the average yields obtained were as follows:—

Sudan grass	1,626 lbs. per acre.
Boer manna	2,400 ,, ,,
Oats (summer)	2,075 ,, ,,
Teff (one crop only)	4,441 ,, ,,
Velvet bean hay	2,767 ,, ,,
Kudzu vine hay	2,800 ,, ,,

The above was an exceptionally fine crop of teff grass, sown on the 1st of January at the rate of 8 lbs. per acre. One lot sown as a catch crop on the 16th February gave a yield of only 1,456 lbs. per acre. The mixed crops were sown on the 1st January, 1920, and in the case of the third mixture the peas were prominent throughout. The total amount of seed used was proportionately the same as for the pure sowings. The yields of hay were as follows:—

Sudan and oats	2,742 lbs. per acre.
Sudan, teff and oats	4,662 ,, ,,
Sudan, teff, oats and peas	4,884 ,, ,,

These trials confirm results obtained elsewhere as to weight and the additional advantage of a better ration will recommend the practice to the farmer's attention.

Green Manuring Trials.—Closely connected with the question of fodder is that of green manuring, where the crop instead of being fed to the animal is fed to the ground by being ploughed in. The predominant value of leguminous crops for this purpose is well known on account of their capacity for contributing nitrogen to the soil through the medium of nodules formed on their roots. There are, however, other considerations which enhance the value of any crop as a green manure. One of these is the rapidity with which the stems and leaves rot and become incorporated with the soil. Crops that rot slowly frequently fail to shew the beneficial results of ploughing in until the second season. One of the most valuable crops in this respect is the Niger oil plant (*Guizotia oleifera*), which when ploughed in in April this last season became almost completely incorporated with the soil in the course of about two months. A test under identical conditions was made with a number of crops with a view to finding the comparative weight of green material available to be turned under.

The weights obtained were as follows:—

Niger oil	29,040	lbs. per acre.
Sunn hemp	19,344	,, ,,
Gotani (or sword) bean	14,112	,, ,,
Kaffir beans	13,680	,, ,,
Black velvet beans	13,369	,, ,,
Florida velvet beans	13,146	,, ,,
Ground nuts (Virginia)	7,920	,, ,,

Attention has already been drawn to the heavy weight of green material obtained from the Niger Oil plant (see *Rhodesia Agricultural Journal*, August, 1918, page 330), and the plate here reproduced from that issue will give a good idea of the density of growth of this crop in Rhodesia. It has, therefore, great possibilities both as an oil crop and as a soil renovator, and it is confidently recommended for trial to farmers on all classes of soil. The Sunn hemp (*Crotalaria juncea*) has its deep root system to recommend it. These roots produce nodules freely, but the stems present greater difficulties in ploughing in and do not rot so readily. The ground nuts, although yielding the smallest bulk of green material, produce by far the greatest quantity of nodules on the roots. It will be noted that the kaffir bean practically equals the velvet bean in bulk weight, proving itself in this respect considerably superior to the cowpea, which is only an improved and selected form of kaffir bean. Among the most promising of the new crops tried this last season both for seed and foliage is a new variety of Dolichos bean known as Woodforde's dolichos, shewn in plate 5. This bean has one disadvantage of requiring a long season to set seed. Extended trials with this crop will be undertaken.

Cereals.—The past season with its uniform rainfall was favourable to this class of crop, and no one could fail to be impressed with the great possibilities of cereals under advantageous circumstances in this country. This success extended to the seed in such crops as linseed, field peas and Niger oil. It must not be supposed that the returns were good in the case of wheat and oats. In these cases, in spite of magnificent stem and leaf growth (see Plate 2), the attack of rust in the later stages prevented good yields of grain from being obtained. The discovery of rust resistant varieties of these crops would be a boon of incalculable money value to Rhodesia, seeing that the plants thrive so well. Our winter crops of wheat and oats under irrigation, when the rust is less active, are proof of this.

Buckwheat has always proved particularly free of pests, and the yields obtained this year were as follows:—

Buckwheat—imported seed	1,236	lbs. per acre.
,, own seed	1,396	,, ,,
,, catch crop sown 18.2.20 after field radish on manured ground ...	936	,, ,,

On a larger scale at Gwebi this crop sown on the 5th January, after a previous crop of maize, gave an average yield of 720 lbs. per acre.

Plate IV. Buckwheat, common. Agricultural Experiment Station, Salisbury, 1919-1920.

Plate V. Woodforde's Dolichos, a promising soiling crop. Salisbury Experiment Station. 1919-1920.

There would seem to be no reason why this cereal should not be grown on a far larger scale, and local millers express themselves prepared to handle this crop should it be grown sufficiently extensively.

Kaffir Corn Varieties.—In all 18 varieties were tried for general yield and suitability to Rhodesian conditions. The principal enemies of this crop are birds and stalk borer. So called bird-proof varieties have appeared from time to time, but their reputation has not been long lived in this country. Most of these varieties did not appear promising, largely owing to their susceptibility to attacks by stalk-borer. Two varieties, however, shewed remarkable resistance in this direction, and will be tried further on a larger scale. These are "Jiba" and "Bird-proof."

Kherson Oat.—This early variety thrives exceedingly under Rhodesian conditions, suffering from rust only in its later stages. It can thus frequently be cut with advantage for fodder before the ravages of rust have become excessive. The seed of this variety appears to be naturally light, and no heavy yield is to be anticipated; but little seed consequently finds its way to the market. Enough seed should therefore be saved for the farmer's own use in further propagating the crop. The average yield of seed this season worked out at 462 lbs. per acre, equal to about three and a half bags. An improved American variety of this oat called the *Minnesota* proved far more susceptible to rust, and it was not found possible to save any seed.

Field Peas.—The variety used was the Black-eyed Susan pea, and an entirely satisfactory crop was obtained, the total yield amounting to over four bags of dried peas per acre. The fodder obtained in addition was very considerable. The success of this crop would seem to indicate that it might be usefully employed as a garden crop under summer conditions. At the Gwebi farm the yield of peas on a large scale amounted to 400 lbs. per acre after a previous crop of maize, as compared with 205 lbs. per acre for white haricot beans and 210 lbs. for Canadian Wonder grown under similar conditions. Seed of this pea is now available from this Department.

Dhal.—The utility of this valuable crop is greatly impaired by the lateness of its maturity, seed being rarely ripe in Rhodesia before the end of June. At this period the plant is very frequently cut down by frost in the more exposed districts of the country, thus rendering the crop of no value for seed production. This useful pea is very largely grown in India, where about forty different varieties are cultivated. During his stay in India Mr. Mundy was able to secure about thirty-four varieties, and in the hope of finding a variety that would set seed early these were tried at the agricultural experiment station. Only three of these proved to be slightly earlier than the common white dhal, and as they did not possess its vigour they cannot as yet be recommended as a substitute. The former prejudice on the part of stock against this new crop seems to be breaking down, and reports shew that it is well liked as a pasture. There has of course never been any difficulty with regard to the grain, which forms a valuable addition to the maize ration commonly fed to stock.

(*To be continued.*)

Cotton Culture.

By H. W. TAYLOR, B.Agr., Tobacco and Cotton Expert.

The problem of increasing the production of raw cotton has, for some years, been of vital interest to manufacturers in Great Britain and the Continent. The question is of more importance at present than in past years on account of the unprecedented high prices and also on account of the shortage of supplies. During the 20 years previous to the recent world war, the production of cotton in the United States of America increased 53.2 per cent., and at the same time the price per pound increased 90.4 per cent., which clearly indicates that the demand was increasing faster than the supply.

Five-year period.	Average production in bales per year for the five years.	Average increase in production for the five years.	Average price per pound for the five years.	Average increase in price per pound for the five years.
			d.	d.
1894-5 to 1898-9 ...	9,477,729 bales	...	3·76	...
1899-1900 to 1903-4	10,894,210 bales	1,416,471 bales	5·44	1·68
1904-5 to 1909-10 ...	11,853,019 bales	958,809 bales	5·78	0·34
1909-10 to 1913-14	14,574,862 bales	2,721,843 bales	7·16	1·38
1913-14	16,800,000 bales	2,275,138 bales*	7·26†	0·10
Increase for 20 years	...	5,047,133 bales	...	3·40

*Increase over the previous five years.
†Average price for the 1913-14 crop.

In 1914 the average price of American middling cotton was 7.26d. per pound, while at the present time the same grade of cotton is realising 26.17d. per pound, and the best grade of American upland cotton is quoted at 31.42d. per pound. These abnormally high prices have been brought about by the shortage of raw cotton and the increase in the cost of production.

Prof. J. A. Todd, a recognised authority, at a meeting of the

Textile Institute at Manchester[‡] in May last stated that "The world's supply of cotton for the next five or ten years is seriously threatened. Pre-war records for all the principal crops are hardly likely to be broken, if they are even reached. In the case of the American crop in particular, before the war we had come to look on 15 million bales as about the average, a figure which had twice been substantially exceeded. In future that figure must be taken as the maximum, and the average is more likely to be somewhere between 12 and 14 million bales. Even before the war we had begun to realise the necessity of a cumulative increase of one million bales per annum more every year. So far from obtaining that, we are now going to have, in all probability, reduced crops. The result will be scarcity, which will become increasingly serious as the world's capacity to consume returns to normal. To resume the pre-war rate of increase of consumption will be impossible, because the cotton will not be there." The same authority states that the cost of production in America last year was 24 cents (1s.) per pound, and that the cost of picking had worked out at 5 cents (2½d.) per pound. The figures for the American crop are quoted, as that country supplies 85 per cent. of the cotton used in Great Britain.

In order to increase the supply of raw material, the Empire Cotton Committee is making every effort to establish cotton growing in every part of the British Empire where conditions are favourable for cotton production. In certain parts of Southern Rhodesia the soil and climatic conditions are such that cotton can be grown on a commercial basis, and the following cultural directions are reprinted for the benefit of those who are interested in increasing the production of cotton within the Empire.

The two determining factors in cotton production are soil and climate. Of the two the latter is more important, as cotton can be produced on a variety of soils.

Soil.—The soils which give the best yields of cotton are sandy and clay loams and alluvial soils. The colour of the soil is of minor importance, but the cotton plant is greatly influenced by the texture, humus contents and drainage. Any soil to be suitable for cotton growing must be moderately fertile, well drained, and contain a fair amount of organic matter. Soils which are abnormally rich in plant food do not usually produce the highest yields, as the plants develop vegetation rather than fruit when grown on such soils. On the other hand, if the soil is poor in plant food, a profitable crop of cotton cannot be produced without the use of fertilisers or manures. The types of soil in Southern Rhodesia which appear to be best suited to cotton growing are those derived from the diorite formation and the soil on the contact between diorite and granite. Some of the deep and well-drained sandy soils are also suitable for this crop. Sandstone soils are also excellent for cotton production.

Climate.—The climatic conditions required for profitable cotton culture are as follows:—(1) A growing period of six months or more without frost; (2) a moderate well-distributed rainfall during the growing period; (3) plenty of sunshine and little or no rainfall during the maturing period. The cotton plant requires a rather long period for full development and is very susceptible to frost. This appears to be the deciding factor in cotton culture in Rhodesia, as the growing season is short in many parts of the Territory. In those areas where the growing period—from the first spring rains to the first killing frost—is less than six months, cotton cannot be successfully produced. In many parts of Rhodesia the rainfall is ample, as cotton can be produced with 20 to 25 inches of rainfall. Where the rainfall is less than 20 inches, it is doubtful if the crop will succeed. Throughout Rhodesia there is an abundance of sunshine during the latter part of the growing season, which is a condition required for successful cotton cultivation.

[‡] *The Textile Mercury*, 15th May, 1920.

Preparation of the Soil.—The soil for cotton growing should be well prepared. The best time for breaking is during the winter, and the soil should be brought into good tilth after the first spring rains. The cotton plant is very tender and delicate when it first appears above the surface of the soil, and the land intended for the production of this crop should therefore be well prepared, in order that the young plants may have every advantage as regards soil moisture and plant food during the early stages of growth. Ploughing should be as deep as the surface soil will permit. Care should, however, be taken to see that the implements do not bring to the surface a large amount of subsoil. It is better to plough slightly too shallow than too deep.

Planting.—Cotton should be planted as soon as possible after the first spring rains. If the rains are late, it may be well to plant the seed in the dry soil, in order that germination may take place as soon as possible. The only danger in planting in dry soil is that the first rain may be somewhat in advance of the regular rainfall, and only sufficient to cause germination. In that case, the young plants would perish and replanting would be necessary. Planting can be done either by hand or with a planter, but the latter method is advised where possible. Cotton planters are so constructed that they will also plant maize, but the ordinary maize planter will not plant cotton unless the seeds are so treated that the fine short linters are pasted down so that they will not "felt" together. The rows are placed 3½ feet apart, and the seeds are planted thickly in the rows, to ensure a perfect stand. The planter should be so adjusted that the seed will be placed in the soil to a depth of about one inch. If planted too deeply, the young plants will not be able to reach the surface of the soil. About 20 lbs. of seed are required per acre.

Cultivation.—As soon as the plants are up sufficiently to follow the rows, cultivation should be commenced. No fixed number of cultural operations can be laid down, but cultivation should be frequent enough to keep the surface of the soil in a finely pulverised condition and the crop free from weeds and grass. The early cultivation should be fairly deep, to aerate and warm the soil, but later cultivation should be shallow, in order that the lateral roots may not be injured. Hand cultivation is necessary to remove the weeds and grass growing in the row between the cotton plants. When the plants begin flowering, intertillage with implements should cease, but if weeds spring up later, they must be removed by hand hoeing.

Thinning.—When the cotton plants are about 6 inches in height, they should be thinned to stand about one foot apart in the rows. Close spacing in the rows prevents an abnormal development of wood and foliage, and induces early development. In thinning, the strong vigorous plants should be left and the weak plants removed.

Picking.—When about one-third of the bolls have opened, picking should be started. In picking, only the seed cotton should be removed, and care should be taken to prevent dry leaves, portions of bolls or other foreign substances from being mixed with the cotton, as "trashy" cotton is of lower value. The seed cotton should be dry when picked, but if moist from dew or from light showers, it should be allowed to dry in the sun before being stored. Ordinary grain bags can be used as receptacles when picking. A reim or strong cord is fastened to either side of the mouth of the bag, and then slung over the neck and one shoulder. The mouth of the bag is held open by a wire hoop, so that both hands of the picker are left free. Natives are rather slow in the beginning, but can be easily taught so that they will pick sufficient cotton to pay their hire. They should be instructed to grasp each lock of the boll at the same time, and to remove the cotton with a quick movement of the hand. The seed cotton should be stored in grain bags or wood packs until the whole of the crop has been picked, when it is sent to the gin to be prepared for market.

Value of Cotton Culture to Rhodesian Farmers.—At the present time there are only two field crops being produced on a large scale in Rhodesia. On account of the different soil and climatic requirements of these two crops and the difference in the amount of labour required per acre, they cannot generally be used in rotation. It is thought that cotton may be a crop which can be adapted to a rotation which will be of much benefit in conserving the fertility of the soil. Farmers also require a crop which is not exhaustive of soil fertility. The following table will shew the amounts of plant food removed from the soil by tobacco, maize and cotton:—

Plant Foods removed from the Soil by Crops.

Crop.	Nitrogen.	Phosphates.	Potash.	Total.
Cotton—	lbs.	lbs.	lbs.	lbs.
300 lbs. lint	1.02	0.30	1.37	—
650 lbs. seed ...	20.34	10.67	7.84	—
	21.36	10.97	9.21	41.54
Maize—				
8¾ bags	32.14	12.36	7.06	—
4,000 lbs. stover	41.60	11.60	56.00	—
	73.74	23.96	63.06	160.76
Tobacco—				
1,000 lbs. leaf ...	44.00	5.00	52.00	—
353 lbs. stalks ...	12.00	2.00	17.00	—
	56.00	7.00	69.00	132.00

From the above it will be noted that a crop of maize removes about four times as much plant food from the soil as a crop of cotton, and a crop of tobacco more than three times as much. Cotton when prepared for market is not a perishable product, and can be stored for a long period of time without deterioration. It is therefore suitable for export, and there is an almost unlimited market for cotton overseas. It is also a profitable crop when grown under favourable conditions of soil and climate, and can be made the source of a large additional revenue to the farming community.

Colonial Cotton as an Asset to the Empire.—The cotton industry in Great Britain has been built up to tremendous proportions. It has been estimated that about £500,000,000 is engaged in or directly dependent on the cotton trade, and that no less than 10,000,000 of the population are directly or indirectly dependent on this trade for their daily bread.* This immense industry has been built up on raw material imported from overseas, and principally from the United States of America. The extent to which the cotton industry in Great Britain is dependent on American raw material is shewn by the following figures:—

Five Years' Trade—Raw Cotton—1909-13.†
(Annual Average.)

From	Imports. Value.
United States of America	£48,200,000
British Empire	2,326,000

Not only is the cotton trade in Great Britain largely dependent on supplies of raw cotton from the United States of America, but it is doubtful if an ample supply will always be available. In the first place, the United States of America is steadily increasing her cotton manufacturing, so that less raw cotton is available, and secondly, the cost of production is increasing so rapidly that cotton growing will not pay unless very high prices are obtained.

Cost of Cotton Production in the United States of America:—†

Approximate cost in 1914—8 cents (4d.) per lb.
.. .. 1915—12 cents (6d.) per lb.
.. .. 1916—18 cents (9d.) per lb.
.. .. 1917—20 cents (10d.) per lb.
.. .. 1918—23 cents (11½d.) per lb.

Should the supply of raw cotton from the United States of America be cut off from Great Britain on account of any unforeseen difficulty, the cotton trade of the British Empire would be paralysed, unless new fields could be developed. It is, therefore, of the greatest importance to the Empire that new cotton fields be developed, in order that a supply of raw cotton is assured, and if possible these new fields should be located in British Colonies.

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*Bulletin No. 64, British Cotton Growing Association.
†*The Textile Mercury*, 15th March, 1919.

The Battle of the Breeds.

STATISTICAL RETURNS OF PURE BREEDS OF CATTLE IN SOUTHERN RHODESIA.

By ERIC A. NOBBS, Ph.D., B.Sc.

There appeared in this *Journal* for August last a compilation of returns received from farmers, furnishing particulars of the numbers of cattle in Southern Rhodesia, their distribution by districts and their classification by sex and breeds. A further analysis of these figures reveals some interesting points which will appeal to the supporters of the different European breeds, indicating their present actual position as regards popularity and opportunities for obtaining locally-bred animals.

The accuracy of the data here published depends primarily upon that of the information furnished by individuals from which the aggregates are prepared. For this reason there is certainly a margin of error, but this imperfection is likely to be approximately the same in all cases. It is further to be remembered that the figures were supplied as at 31st December, 1919, since which date there has happily been a steady influx from beyond our borders as well as a good breeding season, and the numbers of breeders and pure-bred stock alike are growing from day to day. It is hoped by the publication of this information now to arouse an interest which will be reflected in complete and careful returns being supplied when again called for at the end of the current year. No similar comparison of breeds has been seen from the Union, and the relative strength of breeds there can perhaps best be ascertained by a comparison of the numbers registered in the herd books, which, however, include the pedigreed animals from Rhodesia.

In preparing these notes it has been observed that the different breeds are fairly evenly distributed all over Southern Rhodesia, in spite of the varying nature of the country. It cannot be said that any one particular breed has shewn special suitability to any particular region or has captured any district to the exclusion of other breeds. In certain instances some localisation is observed and commented upon, but these appear due to causes other than exceptional merit or peculiar adaptability to environment or locality.

The determination of purity has had to be left to the discretion of the cattle owners furnishing the returns, and there is some evidence of elasticity in definition of the term, the leading breeders limiting themselves to pedigreed stock, whilst others appear to have included cattle of doubtful origin, of type rather than of strict breeding. It is admitted that registration in a herd book is not an essential condition to the object in view, which is to arrive at an idea of what breeds predominate and to what extent each is being favoured at the present time.

Of all European breeds the Shorthorn, including the Lincoln Red, is pre-eminent, numbering 1,727 out of 5,075, or 34 per cent. of the whole, that is over one-third. Shorthorns number more than double of either the Devons with 823 head, the Frieslands with 805, or the Herefords with 776 head. A high degree of quality has been attained with the Shorthorn breed in Rhodesia, due to the superior class of animal imported, and this is no doubt a cause of their popularity. In certain other breeds unfortunately Rhodesia has been used as a dumping ground, with consequences natural but regrettable to their reputation. Actual breeders of Shorthorn cattle in Southern Rhodesia, that is, farmers owning both bulls and females described as pure, though not necessarily pedigreed, number no fewer than 57; the cattle consist of 1,040 females and 372 bulls. Apart from this there are 173 other farmers using 315 pure Shorthorn bulls on native or grade cows. The stud breeders are found all over the country, no one district being pre-eminent; a score of breeders operate on a fairly large scale, and the rest own just a few head of stud stock, averaging four females each; whilst of the large number of farmers who use the Shorthorn bull it will be observed from the above figures that on an average they have about two each. There is of course a very large number of grade Shorthorn bulls also in use, some of which are highly bred, and the influence of the breed is to be seen very clearly from one end of Rhodesia to the other.

The stud breeders of Afrikanders appear to rank high in numbers of cattle, but this is probably due to a somewhat loose interpretation of the term "pure-bred," both as regards bulls and cows. The return of 1,535 Afrikander cattle is divided amongst 26 stud breeders, 48 stock-owners using them only for grading purposes. These high figures are not borne out by a corresponding prevalence of Afrikander stock, pure or mixed, on our farms, in our markets, or at our shows, and must therefore be accepted with reserve. Undoubtedly much of this blood has been brought into Rhodesia with benefit, but the numbers of pure-bred Afrikanders certainly fall short of the above figures, which probably embrace a considerable amount of grade stock of Afrikander type.

Next in numbers to Shorthorns amongst European breeds we find the Devon—the true or North Devon. The Devon claims some ten supporters, and the cattle number 424 females and 113 bulls, the balance of the 823 head being bulls in use in herds for grading up purposes, so that the influence of this breed on the cattle of Southern Rhodesia is already pronounced. It is claimed that this breed does well on less fertile land; after all the best soil is always the least plentiful, so that its scope is wider than that of breeds demanding the best possible conditions. If lighter and less rapidly maturing than some, yet the Devon can be fattened and finished on veld where heavier breeds not only fail to make flesh, but even become stunted. The Devon has also shewn itself well adapted for rough country, although it responds well to favourable conditions. The breed is particularly well represented in the midlands and western districts, and is less frequently met with on the northern and eastern sides of the Territory, though so far as the nature of the country is concerned there seems no good reason for this distribution, which will no doubt be modified as bulls locally bred become more readily obtainable. Besides the numerous individuals who possess single bulls, there are a number of ranches with from ten to twenty and even more Devon bulls.

The South Devon is to be clearly distinguished from the breed of similar name. Though less numerous, mustering only 164 head, and less well known, this breed has in a short space of time won for itself a recognised position throughout the sub-continent, and is to-day well established. There are four stud breeders of South Devons in the country, owning amongst them 35 pure-bred bulls and 95 females, so that a good supply of Rhodesian-bred stock of this breed may be looked for in the early future. Users of the breed having bulls but no pure-bred cows number nineteen, distributed remarkably evenly, so that a fair test is being made of the suitability of the breed for the country. The South Devon has made remarkable headway in the Union, especially in the Free State, and its progress in this Territory should be watched by all not already committed to any other breed.

Considerable care is manifest in the returns furnished by the breeders of Herefords. The information collected indicates that twenty-one breeders of pure stock possess amongst them 395 females and 188 bulls, whilst fifty-five farmers use Hereford bulls on mixed stock. This vouches for the popularity of the breed, which is found in every part of the country, though most of the pure-bred stock is raised in the vicinity of Bulawayo. The breed is found to do well and to impress its merits to a very marked degree on foundation stock of native or indeterminate origin. At our shows Herefords have always distinguished themselves, and their influence is being appreciated in the stock yards as well.

The Aberdeen Angus breed has of late come into prominence; the total number of pure animals is given as 408, of which 189 are females, owned by thirteen breeders, whilst thirty-nine owners of bulls only are recorded. The breed is strongly represented in the districts of Salisbury, Mazoe and Lomagundi, though it is also rather widely distributed elsewhere. Several prominent breeders are located in Matabeleland, and most of the pedigreed stock is in that province.

The Sussex breed boasts five breeders, owning amongst them 119 females and 123 bulls, whilst seventeen supporters own bulls only. These latter seem to be located more in Mashonaland than in Matabeleland, though the breeders are evenly distributed. It is noticeable that certain of the largest ranchers in the country have gone in for this breed, and are rearing their own bulls, which accounts for their comparative rarity at our shows and markets.

Considering the scope for dairying in connection with mixed farming and small holdings, it is remarkable that the Friesland breed represents only 15.8 per cent. of the European breeds in the country. Friesland females, reputed pure, though they are by no means all registered in the stud book, number 586, and are owned by thirty-three breeders scattered over all parts of the country, one-third holding large herds, the rest only a few individual animals. These breeders account for 109 bulls, whilst sixty-eight other supporters of the breed owning only bulls give a total for the Friesland breed of 805 head. The Friesland is undoubtedly the principal milk breed in the country, and though not as popular as it is in the south, still takes an important place. Cross-bred Friesland stock is numerous. Naturally the breed is held by the dairyman and mixed farmer and not by the rancher.

The Ayrshire breed, as is only to be expected from an essentially dairy type, is somewhat scarce. It numbers only 43 pure-bred females, held by four owners, and 28 bulls, which are domiciled exclusively in Mashonaland, except for one specimen in Matabeleland. Recent purchases not yet recorded in the return will no doubt give a fillip to this eminently desirable dairy breed.

To come to the less popular breeds, only one breeder of Red Polls is recorded and six users of bulls, accounting for a total of 17 animals. Only one breeder of Galloways is known and one owner of Jerseys.

It is a generally recognised fact that the most prominent breeders of stud stock are to be found in Matabeleland, and at the agricultural shows the bulk of the prize winners are usually from that province. Certainly the largest and best known pure herds are there. It will come as a surprise to many, therefore, to learn that of the one hundred and seventy-five breeders of stud cattle in Southern Rhodesia, one hundred and two hail from Mashonaland and seventy-three from the sister province. Apparently a number of farmers there possess only a few head of pure-bred stock and do not exhibit them, or have only recently entered the field as breeders. This unlooked for result of the examination of the returns indicates a probability of interesting developments in the show-yards in the early future.

Probable Storm Flow from a Catchment Area.

By C. L. Robertson, B.Sc., A.M.I.C.E., Hydrographic Engineer.

The question of the probable storm flow from a catchment area is of great practical importance when any storage scheme is embarked upon. It is a subject on which it is easy to over-estimate, and the popular view is usually an over-estimate. An over-estimate may mean in practice :—

(1) That a dam with too large a storage capacity will be erected. It will be found that this will fill only in very good years and not in normal years. A lower dam which would fill in normal years would have been the economical solution for this site.

(2) That the area capable of being irrigated from this dam in normal years would be also over-estimated, and it would be found that there was not sufficient water available for the area contemplated.

If the smaller area had been originally considered as being the area capable of being normally irrigated the scheme might not have been embarked upon at all, as being too costly for the area served.

The figures as given below are a conservative estimate and are derived from a study of the run-off figures for Cleveland dam. Before proceeding to discuss these a study of the following two schedules will be interesting. The year 1916-17 was a year of low rainfall, whilst 1917-18 was a year with rainfall well above the average.

SCHEDULE I.

Run-off, Cleveland Dam—Flood Season 1916-17.

Flood period.	Total discharge, cubic feet.	Rainfall, inches.	Maximum fall in 24 hours.	Percentage run-off.
Nov. 1—8 ...	190·400	0·91	0·44	1·29
Nov. 9—17 ...	482·000	2·24	1·02	1·32
Nov. 18—30 ...	Nil	0·96	0·69	Nil
Dec. 1—14 ...	617 000	2·40	0·69	1·59
Dec. 15—31 ...	915·000	3·42	1·33	1·64
Jan. 1—6 ...	636·000	1·63	1·05	2·39
Jan. 7—21 ...	868 000	1·63	0·43	3·28
Jan. 22—31 ...	52·000	0·76	0·46	—
Feb. 1—9 ...	36·000	—	—	0·71
Feb. 10—15 ...	85·000	0·38	0·36	1·37
Feb. 16—21 ...	56·000	0·53	0·35	0·65
Feb. 22—28 ...	309·000	1·23	0·55	1·34
March 1- 9 ...	225·000	0·90	0 34	1·24
March 10—28 ...	43·000	0 46	0·25	0·57
March 29—31 ...	156 000	0·34	0·34	2·51
April 1—19 ...	89·000	0·89	0·54	0·61
April 20—30 ...	236·000	1 06	1·04	1·37

SCHEDULE II.

Flood Season 1917-18.

Flood period.	Total discharge, cubic feet.	Rainfall, inches.	Maximum fall in 24 hours.	Percentage run-off.
Nov. 1—12 ...	380·500	1·47	1·15	1·59
Nov. 13—27 ...	358 000	2·20	0·88	1 00
Nov: 28—Dec. 3...	126·000	0·96	0·60	0·94
Dec. 4—6 ...	426·500	2·49	1·35	1 05
Dec. 7—9 ...	1,058·000	2·85	2·85	2·28
Dec. 10—15 ...	257·000	1·16	0·55	1·36
Dec. 16—19 ...	173 000	0·52	0·36	2·04
Dec. 20—26 ...	2,091·000	2·72	0·73	4·73
Dec. 27—31 ...	468·000	0·71	0·45	4·05
Jan. 1—5 ...	599·000	0·77	0·44	4·79
Jan. 6—13 ...	7,086·000	4·49	2·30	9·70
Jan. 14—22 ...	9,480·000	3·22	0·80	18·14
Jan. 23—Feb. 1 ...	62,940·280	7·44	1·89	52·02
Feb. 2—10 ...	54,210·800	4·45	1·16	74·94
Feb. 11—18 ...	9,320 000	1·78	0·78	32·19
Feb. 19—March 8	22,558·360	3·29	1·13	42 16
March 9—April 18	36,600·720	4·39	0·95	71 78
April 19—30 ...	1,219·280	0·35	0·20	21·43

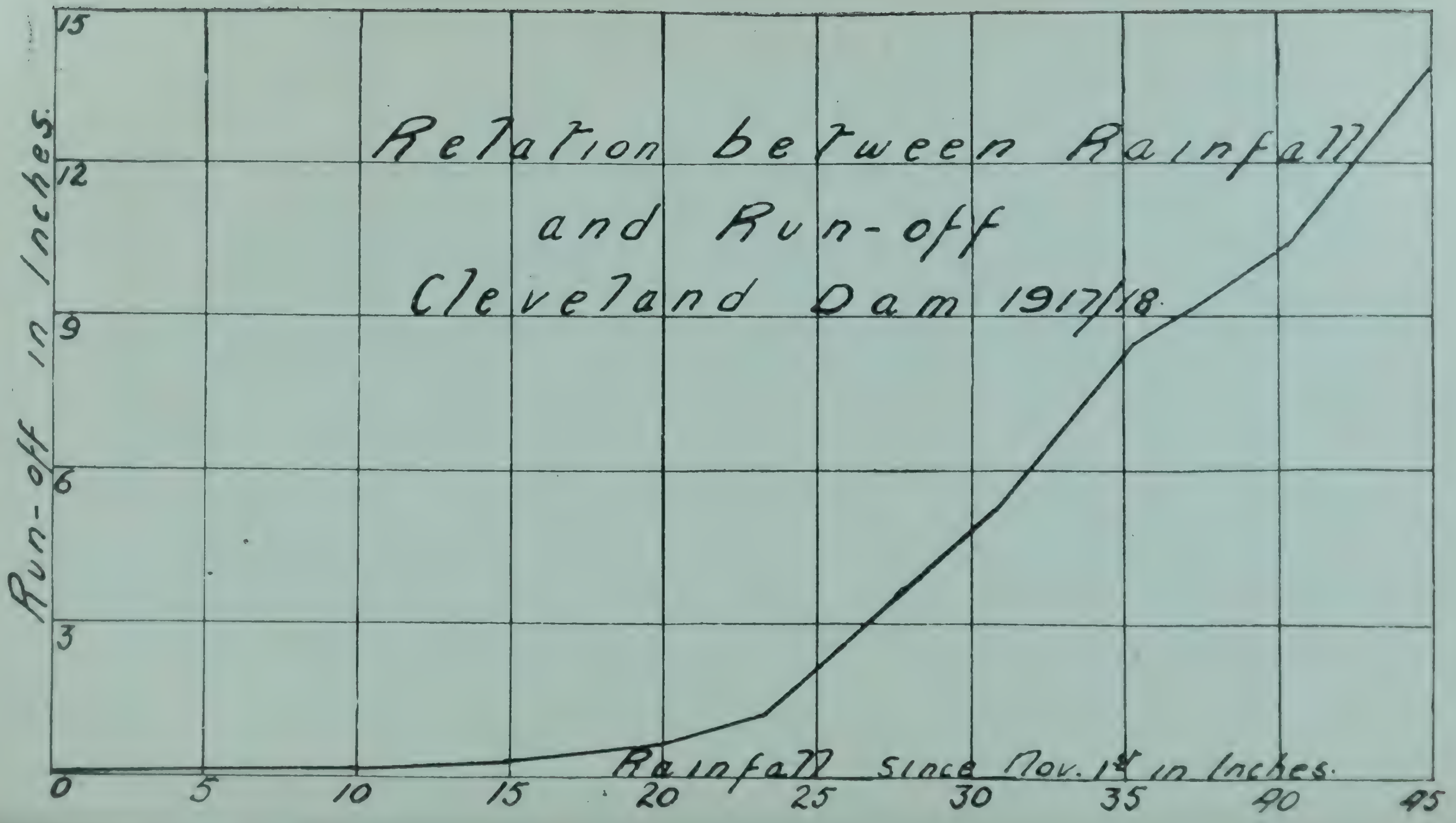
A study of these figures makes it clear that the all-important point which determines the percentage run-off from a catchment area is the degree of saturation existing in the area at the time of the fall. Until the total fall has been sufficient to almost completely saturate the area, the percentage run-off is very low, and is only in the neighbourhood of 1 to 3 per cent. The quantity of rain required in the Cleveland catchment to saturate it appears to be about 18 to 20 inches, and the period of this fall not to be longer than 80 days. During 1916-17 this condition was not fulfilled, and hence the very low percentage of run-off. During 1917-18 we observe the low percentage of run-off during November and December before this condition is fulfilled. During flood period 6th to 13th January, however, when the total fall on catchment since 1st November was 20.34 inches, the run-off percentage assumes the respectable figure of 9.70 per cent. These percentages rapidly increase as the catchment becomes more and more saturated. It is to be noted also how very slightly the intensity of the fall influences the percentage run-off until this condition is fulfilled. A fall of 2.85 inches in 24 hours on 7th December only produced a run-off of 2.28 per cent.

A convenient way of expressing run-off is to put it in terms of inches of rain running from the catchment. For instance if 10 inches of rain have fallen on a catchment during a certain period and we find that the run-off is 10 per cent., then this would be equally expressed if we said a 10 inch rainfall produced 1 inch of run-off.

If we consider only the rainfall occurring between 1st November and 30th April and express the run-off during this period in inches, the increased run-off as the catchment becomes saturated is clearly shewn. The following schedule for the year 1917-18 has been drawn up for the Cleveland catchment on this basis:—

Total fall since 1st Nov. in inches.	Run-off in inches.
1.47	0.023
3.67	0.045
4.63	0.054
7.12	0.080
9.97	0.156
11.13	0.172
11.65	0.182
14.37	0.311
15.08	0.330
15.85	0.367
20.34	0.802
23.56	1.386
31.00	5.256
35.45	8.591
37.23	9.164
40.52	10.551
44.91	13.702
45.26	13.777

The accompanying curve shews this relationship graphically. It is again to be noted how marked the deflection in the curve is once the



Relation between Rainfall and Run-off Cleveland Dam 1917/18.

total rainfall has exceeded 20 inches. The amount running off will of course differ in different types of catchment areas. The factors influencing the run-off from a catchment area in the order of their priority are:—

(1) Distribution and amount of rainfall on the catchment area. This has to be considered in conjunction with average length of dry spells between the rain periods.

(2) Average slope of the catchment area.

(3) Nature of the catchment area, whether, for instance, it is rugged, or covered with deep soil, or marshy, etc.

(4) Nature of covering on catchment area, *i.e.*, whether tree-covered, bush-covered, long grass, crops, etc.

(5) Nature of geological strata underlying the area and whether it is permeable or impermeable to water.

(6) Size of catchment area—higher percentages of run-off are usually obtained from smaller catchment areas probably owing to the difficulty of accurately measuring the rainfall on a large catchment area.

The following figures may be taken as a conservative estimate of probable run-off from a gentle sloping, grass-covered, catchment area. Only rainfall occurring after 1st November is to be considered.

(1) The first 20 inches of rainfall may be taken to yield 2 per cent. of run-off.

(2) The increment from 20—25 inches may be taken to yield 5 per cent. of run-off.

(3) The increment from 25—30 inches may be taken to yield 10 per cent. of run-off.

(4) The increment from 30—35 inches may be taken to yield 20 per cent. of run-off.

(5) The increment from 35—40 inches may be taken to yield 30 per cent. of run-off.

The practical application of all this is that if one studies the rainfall records of a station near the catchment area and finds—

(1) that in the worst year the rainfall between 1st November and 30th April was 21.50 inches,

(2) that in an average year rainfall during the same period was 32.00 inches,

(3) that in a good year rainfall during the same period was 39.50 inches;

then we find that probable run-off from this catchment area will be—

Bad year—Rainfall 21.50 inches—

2 per cent. of 20 inches = 0.40 ins.
5 per cent. of 1.50 inches = 0.08 ins.

Run-off 0.48 ins.

Average year—Rainfall 32.00 inches—

2 per cent. of 20 inches = 0.40 ins.
5 per cent. of 5 inches = 0.25 ins.
10 per cent. of 5 inches = 0.50 ins.
20 per cent. of 2 inches = 0.40 ins.

Run-off 1.55 ins.

Good year—Rainfall 39.50 inches—

2 per cent. of 20 inches = 0.40 ins.
5 per cent. of 5 inches = 0.25 ins.
10 per cent. of 5 inches = 0.50 ins.
20 per cent. of 5 inches = 1.00 ins.
30 per cent. of 4.50 inches = 1.35 ins.

Run-off 3.50 ins.

Now, 15 square miles is equal to 27.878,400 sq. feet. Therefore if we have 0.48 ins. running off from the catchment, then the yield in cubic feet per square mile of catchment is:—

$$\frac{0{\cdot}48}{12} \times 27{,}878{,}400$$
$$= 1{,}115{,}136 \text{ cubic feet.}$$

Similarly in an average year the yield is—

$$\frac{1{\cdot}55}{12} \times 27{,}878{,}400$$
$$= 3{,}600{,}960 \text{ cubic feet.}$$

Similarly in a good year the yield is—

$$\frac{3{\cdot}50}{12} \times 27{,}878{,}400$$
$$= 8{,}131{,}200 \text{ cubic feet.}$$

Now, during an average irrigation season 87,120 cubic feet are required for each acre irrigated. Therefore exclusive of evaporation and absorption losses in the dam we have the following areas capable of being irrigated *for each square mile of average catchment above the dam.*

Bad year— $\frac{1{,}115{\cdot}136}{87{\cdot}120} = 13$ acres (approx.)

Average year— $\frac{3{,}600{\cdot}960}{87{\cdot}120} = 41$ acres (approx.)

Good year— $\frac{8{,}131{\cdot}200}{87{\cdot}120} = 93$ acres (approx.)

These figures have to be reduced owing to evaporation and absorption losses from the dam. If the dam is of the ordinary farm type of a mean depth of, say, 10 feet, then the areas capable of being irrigated per square mile of catchment may be stated as:—

Bad Year.	Average Year.	Good Year.
6 acres	27 acres	62 acres

Veld Fires.

The following notice regarding veld fires has been issued by the Department of Agriculture. It has been sent to all railway stations, Police stations, post offices, Native Commissioners' offices, Civil Commissioners' offices, Government schools, as well as to all mines and each farmers' association in the Territory. It is to be hoped that the wide publicity thus given this matter will help to diminish the incidence of grass fires, which annually cause so much damage. The notice is printed in English, Dutch and three native languages.

"Attention is drawn to the great damage caused each year through veld fires, which result in destruction of property and in starvation of cattle and sheep.

"The public are reminded that the law provides that any person who shall without lawful authority set alight to trees, bush or grass not his property shall on conviction be liable to a fine, imprisonment and lashes, and also to pay damages for injury so caused.

"All fires lawfully lit on the land of another, or on roads, outspans or vacant land, must be properly controlled and carefully extinguished before departure.

"Every person, before proceeding to burn standing or growing herbage, grass or bush upon his own land, shall give reasonable notice to adjoining occupiers of his intention to do so, and shall state as nearly as may be done the time at which such burning will take place.

"Servants acting under orders or employers directing them are both equally liable to prosecution and punishment for any contravention of the provisions of the law.

"The Administrator may, on request in due form, apply regulations to areas regarding the establishment of fire guards along the boundaries of farms.

"Contraventions of the law are punishable by heavy penalties. For full particulars persons interested are referred to the 'Herbage Preservation Ordinance, 1913.' "

The Bean Stem Weevil.

A MINOR PEST OF BEANS.

By RUPERT W. JACK, F.E.S., Agricultural Entomologist.

The insect to which the above title has been given is frequently responsible for the destruction of small plantings of French beans in gardens, and is also an enemy of the cowpea or kaffir bean. It was identified as a pest from a garden near Old Umtali in 1913, and this appears to be the first record of its breeding habits, although the beetle itself had previously been described under the name of *Alcides leucogrammus*, Erich. Since that year it has appeared annually on the experimental plots at the Agricultural Laboratories, Salisbury, and has been observed on farms in different parts of Mashonaland.

Description.—The adult beetle, a female, is figured at six times its natural size at Fig. 4 on Plate I. The actual length of the specimen including the "beak" is about 10 m.m., or roughly thirteen thirty-seconds of an inch. The "beak," it may be mentioned, is in reality a prolongation of the head, and carries a set of jaws at the end, for, like all beetles, the Bean Stem Weevil is a biting insect. This prolongation of the head is characteristic of the family (Curculionidæ) to which the weevil belongs, and is the origin of the name "Snout Beetles" frequently applied to members of the family. The "beak" or snout varies greatly in shape and size with different genera, being sometimes short and as broad as it is long, and at others very long and slender, many varieties of intermediate forms also occurring. As the Bean Stem Weevil usually carries its head with the "beak" pointing downwards in nature, it is more convenient to measure the insect in this position and leave out the length of the snout. The females are on the average larger than the males, the smallest male in the office collection measuring 6.5 m.m. and the largest female 8 m.m. (in both cases exclusive of the "beak"). The coloration is black and cream in fresh specimens, but the latter colour darkens somewhat with age.

The whitish *larva or grub*, shewn at Fig. 2 on Plate I., is of the usual legless type of members of this family, the head being of a more or less brown ochre colour. There is little variation in the larvæ of allied species of this family, so further description is unnecessary. The *pupa* (chrysalis stage) is figured at Fig. 3 on the same plate and the egg at Fig. 1. All these figures are at the same magnification, namely,

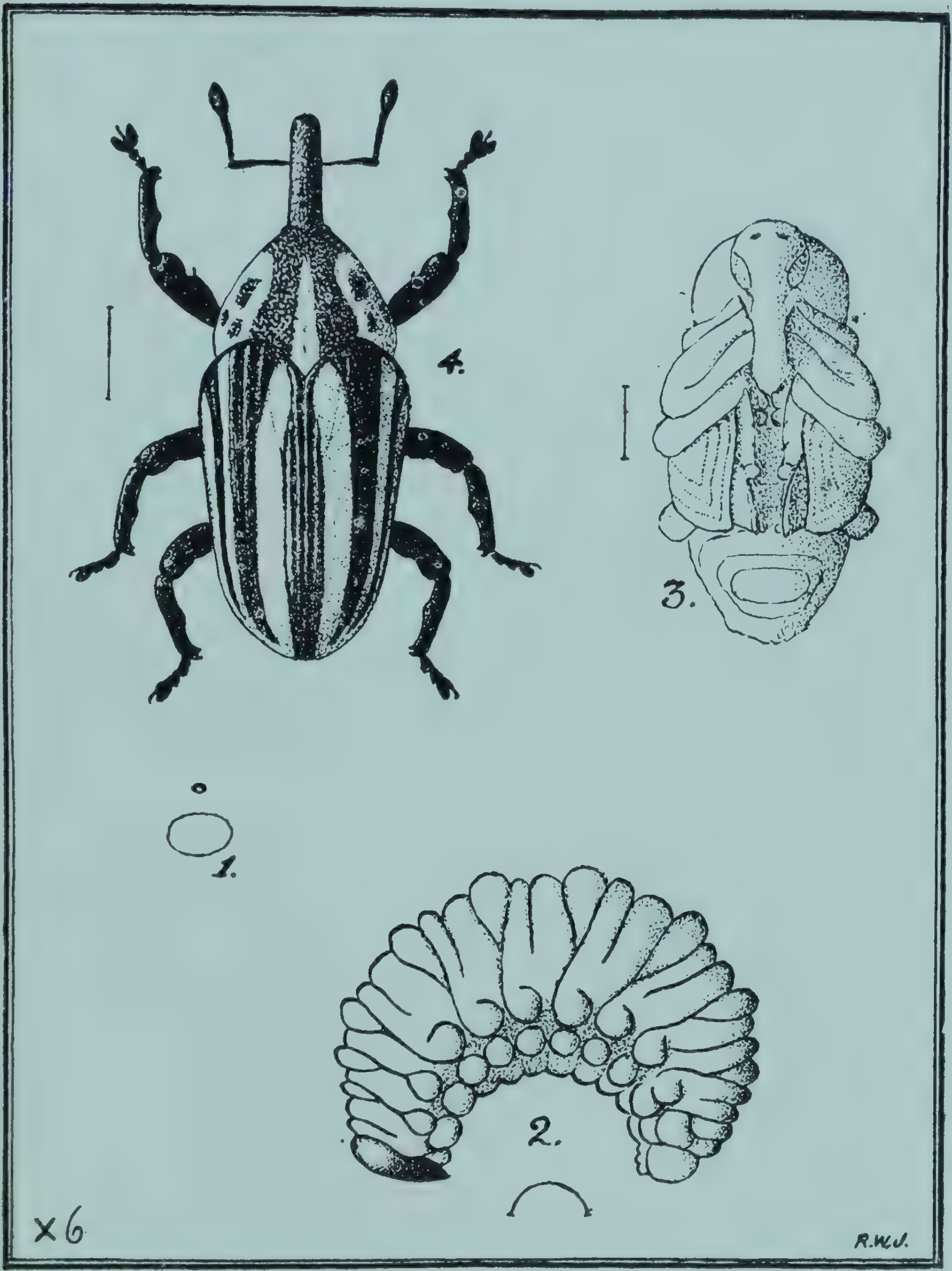


Plate I.

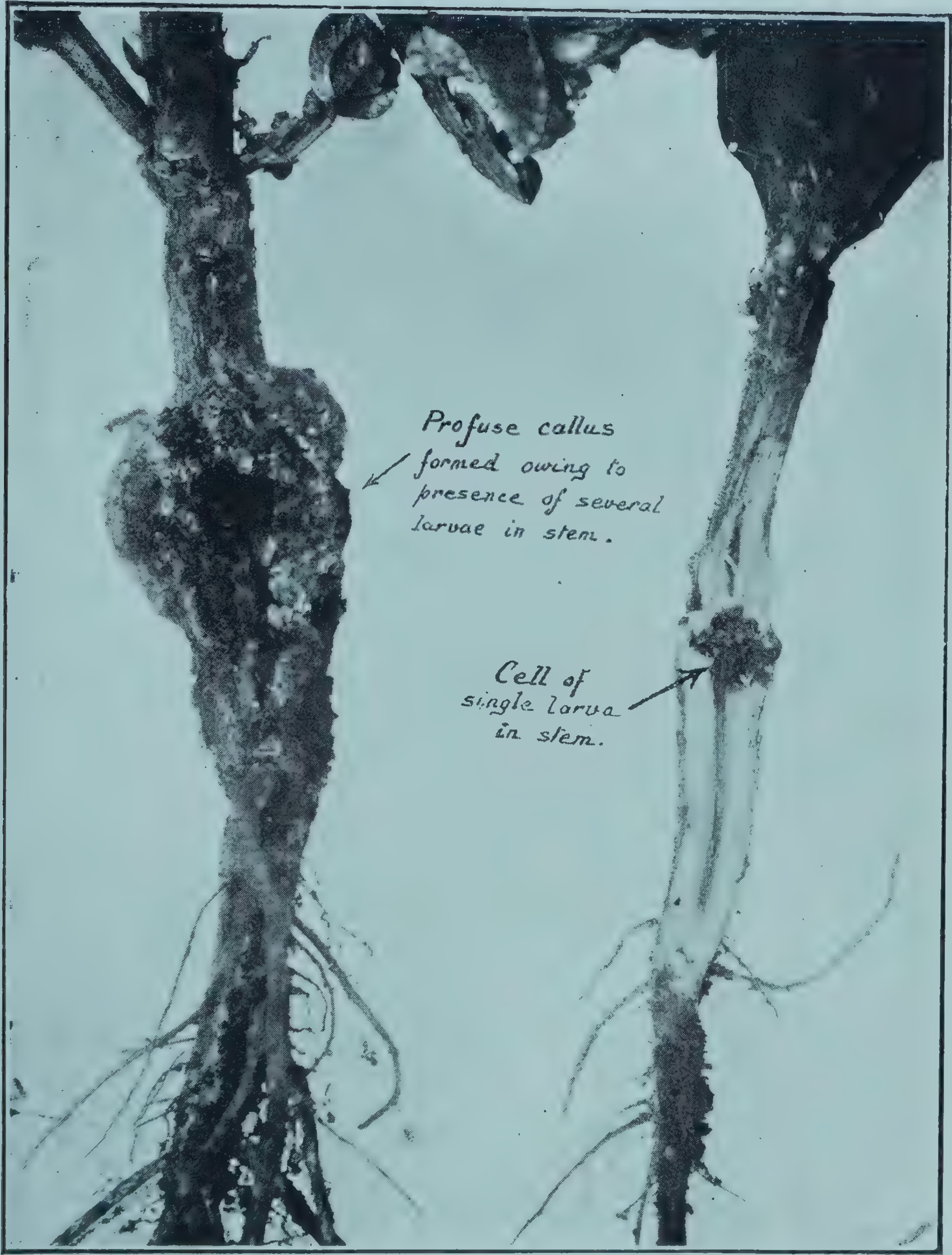

Profuse callus formed owing to presence of several larvae in stem.
Cell of single larva in stem.

Plate II.

multiplied by six diameters, that is to say six times as long and as broad as their actual size. The white shiny egg is thus a fraction over a millimetre (one twenty-fifth of an inch) in length.

Habits.—The beetles feed mainly upon the stems and branches of the plants, in which they cut longitudinal grooves from which much frayed fibre projects. The eggs are laid in cavities at the base of the stems, the cavities being first prepared by means of the mouth-parts. Eggs timed in confinement hatched in about six days. The larva feeds on the tissues at the base of the stem, several commonly being found in one plant, and considerable swelling, often accompanied by formation of callus, results (see Plate II.). Where only one larva is present it is often entirely enclosed in the swollen stem and callus may not form to any great extent, but when, as is often the case, several are present, some are only partially buried in the stem, and much callus may be present. When full-grown the larva changes to the pupa stage within a tough oval cocoon, attached to or enclosed in the plant stem. The substance of the cocoon is mixed with fibres from the plant, and is more or less earth coloured. The adult beetle seems at times to remain in the cocoon for an indefinite period before making its way out to the light of day, but this is more noticeable in the later broods towards the end of the breeding season than when breeding is proceeding at its maximum rate. In the height of the summer the period of development from the deposition of the egg to the emergency of the adult may be as short as 50 days, but many specimens develop slowly and take much longer. In plants exposed for one week to the beetles for egg deposition half-grown larvæ were found at the time the first adults emerged.

Breeding appears to be restricted to a short period of the year. The insect passes the winter as an adult, remaining buried in the ground during the colder months, but emerging to feed, if food is available, as the weather grows warmer. Egg laying has not been ascertained to take place earlier than late November, but except where the plants are watered or the soil is naturally moist, growing beans are not available under cultivation much earlier than this. Adult beetles have been seen in small numbers feeding on kaffir beans in a moist situation in mid-November, but no eggs or grubs could be found on the stems of the plants. This rather suggests that breeding even where conditions are favourable does not commence quite so early. Eggs laid in late November should produce adults from the middle of January onwards, and no beetles have been bred from infested plants earlier than this, although they have been found in the field in early January. The latter are judged to be specimens that have over-wintered, as the plot on which they were found was only planted on 26th November, and could not have been ready for egg laying until December. No earlier beans were in the vicinity. Over-wintering beetles have survived in the laboratory until late January, and then apparently escaped. Beetles bred out during January and February commence to lay after a few days, and this presumably constitutes the second brood, producing adults again during March and April. Beetles emerging in March and April have not laid eggs in the laboratory. It appears, therefore, that not more than two generations mature during the year, and that, owing to the longevity of the beetles, a considerable proportion of eggs laid by over-wintering beetles may produce beetles which live over the next dry season before commencing to lay, and under such circumstances, of course, only one generation occurs. Beetles were collected in small numbers, for instance, on cowpeas on 1st January, and the patch was apparently free from adults until late February and March, when considerable numbers appeared and were collected. These failed to lay in confinement, but lived on through the winter, whilst the January specimens laid freely under similar conditions during that month, adults of the next generation also appearing in late February and throughout March and early April.

Food Plants and Damage. The Bean Stem Weevil, like the Bean Stem Maggot (*Agromyza sp.*) has only been found attacking beans of the genera Phaseolus and Vigna, that is to say, French beans and cowpeas. Velvet beans and other beans of different genera appear to be immune.

A plant may apparently carry one grub without actually dying, but its growth and production are seriously interfered with. Many plants are killed outright and others become yellow and drop their leaves and die more slowly. Damage is sometimes overwhelming where a few rows are grown in kitchen gardens, but the weevil's capacity for increase does not seem sufficient to make it a serious field pest.

Enemies.—No parasites have been bred from the grubs, but observations in the field have indicated considerable destruction by enemies, which eat into cocoons and devour the pupæ or resting adults, and probably also the larvæ. The driver ant *Dorylus helvolus* appears to be the chief enemy in this respect, as this species has been found on more than one occasion swarming in the empty cocoons and cavities of the stem weevil at the time the neighbouring plants contained larvæ. The wing covers and harder parts of the beetles have also frequently been found in cocoons, in which a small hole about one-twelfth of an inch in diameter had been eaten. This may have been the work of Dorylus or not, but no other enemy has actually been observed.

Control Measures.—The insect is merely a minor pest of the kitchen garden, and no control measure is needed other than the removal and destruction by fire of infested plants, care being taken to remove the whole plant for this purpose. As a matter of practice all beans subject to attack should be pulled up and burned as soon as their period of usefulness is over, especially during the earlier part of the season.

Acknowledgment.—Contributions to the life history of this insect, embodied in the foregoing account, were made by Mr. R. L. Thompson, late of this department.

EXPLANATION OF PLATES.

Plate I., Fig. 1. Egg of Bean Stem Weevil enlarged six times. The actual size of the egg is shewn immediately above the enlarged figure.

Fig. 2. Larva approximately full-grown. Actual length indicated by hair line beneath.

Fig. 3. Pupa. Actual length indicated by hair line to left.

Fig. 4. Beetle or adult. Female. Actual length indicated by hair line to left.

Plate II. Two cowpea stems injured by Bean Stem Weevil. The one on the left was attacked by several larvæ, and much callus has formed. The one on the right was attacked by one larva only, and its feeding chamber can be seen in the sectioned stem. From the outside the stem appears only slightly enlarged in the region of attack.

Bushel Weight of Crops

AT THE SALISBURY AGRICULTURAL SHOW, 1920.

As is well known the bushel weight of almost any crop is a good indication of its quality, as plump and well-cleaned seed always weighs more than seed that is shrivelled and badly-cleaned. The corresponding weights for the United States are taken from Bailey's *Cyclopædia of Agriculture.* The weights for South Africa were taken by the writer at the Johannesburg show in 1911, *vide Agricultural Journal of the Union of South Africa,* May, 1911.

Crop.	Bushel weight.	Legal American bushel weight.	South African weight.
Buckwheat, common	49 lbs.	42 lbs.	...
,, silver hulled	52 lbs.		
Linseed—1st prize exhibit	57 lbs.	56 lbs.	56 lbs.
,, 2nd ,, ...	53 lbs.		
Sunflower, black—1st prize exhibit ...	34¼ lbs.	30 lbs.	33 lbs
,, ,, 2nd ,, ...	28 lbs.		
,, striped variety	28 lbs.		
Wheat, Early Gluyas—1st prize exhibit	62½ lbs.	60 lbs.	63-68 lbs.
,, ,, 2nd ,,	59 lbs.		
Oats—1st prize exhibit	38 lbs.	32 lbs.	33½-38 lbs.
Kaffir corn—1st prize exhibit ...	64½ lbs.	56 lbs.	62½ lbs.
,, 2nd ,, ...	63½ lbs.		
Boer manna—1st prize exhibit ...	56½ lbs.	...	52½ lbs.
,, 2nd ,, ...	53½ lbs.		
Teff grass—1st prize exhibit	66 lbs.	...	69 lbs.

Development of Flavour in Butter.

(Concluded.)

By T. Hamilton, M.A., N.D.A. (honours), N.D.D., Dairy Expert.

The faulty flavours in butter which must be guarded against are those commonly described as "rancid," "fishy," "cheesy," "cowy," "stale," "mouldy," "musty," "woody" and many which can be generally classed as "unclean."

A rancid flavour is one which often develops when butter is left standing either under ordinary conditions or in cold storage. It is one of the common faults in South Africa, both of farm butter and of creamery butter; but because of the difficulty of controlling temperature on the farm during the hot months it more frequently occurs in the case of the former than in the latter.

In ordinary creamery practice the flavours in the cream delivered to the factory are very varied, but a bad flavoured cream, or one which will result in a rancid flavour being produced, is almost invariably caused by lack of cleanliness at some stage of the preparation of the cream for butter-making. Of course there are exceptions, which may be due to the cows eating some rank flavoured weed, especially in the early spring, when anything green and succulent is eagerly sought after, or which may be due to the inability of the farmer to cool the cream sufficiently to enable it to stand a long journey in the hot weather. Usually, however, when a consistently bad flavoured cream is produced at any particular farm, a general clean up will remedy the fault.

Rancidity in butter is not only due to a particular germ found in over-ripe or fermented cream, but it is also due to the butter being insufficiently washed. During the hot weather it is most difficult to get a good grain, for the normal temperature of the cream during the hot weather often exceeds 70 deg. F., and it is very often difficult to get the washing water below this temperature. The consequence is that the butter is soft, and it is almost impossible to wash the buttermilk out of the butter. Carefully churned and well washed butter contains an extremely small proportion of curd or nitrogenous matter on which germ life can thrive, consequently such butter, provided it is kept under proper conditions of temperature and surroundings, will retain its good flavour almost indefinitely. However, if for reasons outlined above a large proportion of buttermilk is retained in the butter, this nitrogenous matter is likely to be attacked by bacteria which will cause a rancid flavour to develop in two or three days. Therefore butter made in the height of the season, when cream is plentiful, and when the temperature both of the atmosphere and of the water is high, should never be stored, but should be disposed of as quickly as possible. The alternative is, of course, to send the cream during the hot months to a creamery, where the temperature can be controlled, and where the butter made can be stored under almost ideal conditions.

"**Fishy**" **Flavour.**—This is one of the commonest faults to be found in creamery butter which has been stored for a considerable period awaiting sale or export. In Australia, as in South Africa, the development of this flavour causes losses amounting to thousands of pounds annually, and many investigations have been undertaken to account for this particular taint. It is generally attributed to the feeding of rank herbage, such as is found on the coastal belt, and also to cream being ripened to a high degree of acidity before being churned.

The writer has frequently observed the development of a "fishy" flavour in butter in cold storage where the temperature varies from day to day. Nothing is worse for the keeping qualities of butter than constant variations in temperature, and it is essential that as low a temperature be maintained as is possible. If the temperature of the cold store rises above 30 deg. F., "fishiness" develops, and becomes more pronounced as the temperature rises. The best temperature at which to store butter in cold storage seems to be from 5 deg. F. to 15 deg. F., and critics of South African butter are unanimous in their opinions that the lower the temperature at which the butter can be carried, the better the flavour when it arrives on the London market.

"**Cheesy**" **Flavours.**—These flavours are generally due to the decomposition of the proteid matter retained in the butter. Such butters generally are streaky, the white streaks being due to caseous matter being left either through neglecting to strain the cream before churning or through neglecting to wash the butter sufficiently when in the granular stage.

"**Unclean**" **Flavours** are self-explanatory, and if the cause is removed and the cream properly treated none of these objectionable taints need be developed.

"**Woody**" **Flavours** are caused either by improper treatment of the cream or by bad packing. There is a great dearth of wood suitable for butter boxes in South Africa, and almost all boxes are imported from Canada or Sweden. Some experiments have been tried with boxes made of South African timber, and the boxes have been treated by painting them on the inside with melted paraffin wax and other materials, but up to the present these experiments have not proved a success so far as the export trade is concerned, and the more expensive imported box has come into common use. There is a wide demand for butter boxes in the Union and Rhodesia, as the annual consumption must exceed a quarter of a million, and if this demand could be met by utilising some of our native timbers, a great saving would be effected and a substantial sum of money retained in the country. The extent of this saving can be easily calculated, when it is realised that an imported butter box costs approximately four shillings, and that no allowance is made for boxes when butter is exported.

Mouldy and Musty Flavours are generally due to neglect in storing the cream or through keeping the lids of the cans firmly closed whilst waiting for despatch to the creamery. It is remarkable how many farmers neglect the elementary precautions necessary for the production of good flavoured cream, and how many cans of cream are received at a creamery the top of which is covered with a thick growth of green mould. This green mould would never develop if the can before being despatched to the creamery was regularly stirred and allowed to stand in a cool place covered only with a damp muslin cloth.

"**Feed**" **Flavours** are very common when the grass is rank, especially on the coastal belts. At such times and in such districts it is almost impossible to make a first grade butter for export, as the taint seems to develop with age. When the practice of the winter feeding of dairy cattle, now only too rare, becomes more common in Rhodesia, we can expect more of these taints. When silage, rape or other rank smelling feed is given, it is always preferable to give it to the cows after the operation of milking is complete. It is equally important that every precaution should be taken to have clean stables and a pure atmosphere whilst milking is taking place.

"**Cowy**" **Flavours** are generally the result of unclean stables and the use of "colostrum" or "beastings." No milk from a newly calved cow should be mixed with other milk until at least eight days have elapsed from calving.

"**Stale**" **Flavours** can be caused by keeping the cream too long before churning, but a more frequent cause in South Africa is the use of rusty cans and other receptacles. The danger of the use of these cans is recognised in all dairying countries, and under the Dairy Act of the Union powers are given to inspectors to destroy such cans if their use is persisted in. There can now be no excuse for a farmer using rusty cans, as there are various factories and re-tinning plants in South Africa, where cans and other dairy utensils can be repaired and made almost equal to new. This is a great consideration when the price of all dairy utensils is so high, and full use should be made of these factories by the dairymen of this Territory.

[*Erratum.*—On page 341 of the August *Journal*, sixth line from the bottom, "and the whole ripened until about 6 per cent. lactic acid is developed" should read "about .6 per cent. lactic acid."]

Ducks.

By A. Little, Poultry Expert.

Those going in for ducks have the choice of four breeds. If a good table bird is required, the Aylesbury should be chosen; if a layer, the Indian Runner (fawn or white); if a good all-round dual purpose bird, the Pekin; if a fair utility bird, but a good show bird, the Rouen.

There is a good demand for ducks in this country, and, provided the market is near by, there is also money in it. Therefore, at present, those going in for ducks for table purposes should be near a town.

Duck eggs are not in as great demand, except for cooking purposes, as they should be, considering that their food value is as great as hen's eggs; they are a trifle richer and perhaps slightly less digestible, but still they should be in greater demand than they are.

As a table bird the Aylesbury ranks first; it is a large bird, the flesh is juicy and luscious and of a light colour, it develops quickly, and, if proper treatment is employed, is ready to kill at eight weeks old.

The Pekin ranks next; it is also a large duck, but its flesh has not the quality of that of the Aylesbury, and it does not develop as quickly. As a rule it is not ready to kill until it is nine weeks old; still, the Pekin is usually the more profitable, as it is hardier, and lays, as a rule, better than the Aylesbury.

The Rouen as a table bird ranks third (and it is also a fair layer), for the reason that the flesh is rather dark and not so succulent and good as the first two mentioned; further, it is not fit to kill till it is about ten weeks old.

The Indian Runner is the laying duck "par excellence," but as a table bird falls far short of the Aylesbury or Pekin both in size and quality of flesh; it, however, is the most profitable bird from a laying point of view.

The Muscovy, except as a sitter (it is a fairly good layer), is of little or no value; it is a slow grower, and as a table bird is poor, the flesh being dark in colour and neither succulent nor juicy.

The Orpington ducks have not become popular. Being a recently established breed, the varieties are difficult to breed to colour and type, and its utility qualities do not equal those of the Aylesbury, Pekin or Indian Runner.

Unfortunately we have many crosses of the Aylesbury and Pekin, both being, as they are, to the casual observer, white, and therefore much alike, but their distinguishing characteristics are quite marked, as will be seen from the following:—

	The Aylesbury.	*The Pekin.*
Body	Long and deep.	Short and deep.
Colour of plumage	Pure white down to the skin.	White, with a canary coloured tinge, especially under wings.
Head	Rather flatter and longer than that of the Pekin.	Deep, rounded, short from front to back, and prominent forehead.
Colour of beak ...	Pink or flesh colour.	Orange.
Colour of feet ...	Pink or flesh colour.	Orange.
Colour of shanks ...	Pink or flesh colour.	Orange.

It will thus be seen there are distinct differences in the two breeds, and duck keepers should note this when buying or selling stock.

Hatching.—The eggs can be set either under ducks or hens, or placed in an incubator; they take 28 days to hatch, and require more moisture than do hens' eggs. If placed in an incubator, the room in which it is working should be shut up three or four times during the last 48 hours of incubation, and the floor round the machine sprinkled with boiling water, and the room opened up about half an hour afterwards. During the last two weeks of the hatch the eggs should also be sprinkled, if the weather is hot and dry. Ducks' eggs can be tested four or five days after placing in the incubator, the embryo being clearly seen. It grows very quickly and practically doubles in size on each day of incubation, and on the sixth is spread over a quarter of the egg. The infertile eggs should be taken out, especially those containing a dead germ (discoloration of the shell quickly shews this), as they very rapidly become bad and vitiate the air in the incubator to the detriment of the live embryos.

A duckling does not break the shell directly it has chipped it, but will lie quiet for 24 to 48 hours afterwards and then break out. It is during this time that moisture is especially desirable in the incubator, and there should be sufficient to condense and run down the glass of the door. The drawer should not be opened during this period on any account. After the hatch is well over, remove the ducklings to the nursery, and on no account take them out till they are perfectly dry, otherwise they are very apt to become chilled, which is fatal to them.

Feeding Young Ducklings.—As soon as they are perfectly dry, the ducklings should be removed to a brooder, one similar to that used for chicks (a paraffin or other box converted into a brooder) will do, but the layer of chaff or grass on the floor of it *must* be thick and soft; hard or wood floors are fatal to ducklings, causing, as they do, cramp.

For Killing.—For the first two or three days give two parts of bran and one part mealie meal, with a handful of fine gravel or coarse sand mixed with it and made up to a crumbly consistency, moistened with thick separated milk, if available, or if not, with warm or cold water. Thick separated milk is an excellent food to keep ducks and ducklings healthy, and promotes rapid growth. After the first three days, omit the sand or fine gravel, and on the fifth day add a little meat, chopped finely. Meat meal, fish meal or insects (ants, etc.), *i.e.*, meat food of some kind they must have to produce good and rapid growth. Gradually increase this meat food till at two weeks old they are getting about 5 per cent. of it. At three weeks old the mixture should be one part bran, one part mealie meal and 7 per cent. meat; gradually increase this again till at five weeks old they are getting about 15 per cent. of meat food. Continue this until the ducklings are ten weeks old or until they begin to grow their wing feathers. This is killing time, when they should weigh, if fed and cared for properly, from 10 to 12 lbs. the pair. For the first six weeks they should be fed four times a day and as much as they will eat up clean; leave no food about to become sour, which is most detrimental to them. From six to ten weeks old they should be fed three times a day. After the ducklings are three days old give them plenty of green food chopped finely (lucerne, cabbage, rape, lettuce, onions or onion tops, etc.); always have water before them night and day (and change it four times a day) in a shallow dish, only deep enough to immerse the whole of the beak. Ducks being fed for killing should have no water deep enough to swim in, for they should have very little exercise; in fact only a small run should be provided, otherwise the flesh is not put on quickly and becomes coarse; the object being to get as much good succulent flesh on them in as short a time as possible. Have also in front of them, always, grit and charcoal. A small house only is necessary, but this must have the floor raised above the level of the surrounding ground, always dry and covered with a deep soft bed of grass.

Treatment of Layers and Breeders.—The ducks which are going to be kept for layers and future breeders must be treated differently to those destined for killing, *i.e.*, after they are five to six weeks old; when the ducklings are this age they should be gone over and the most precocious and promising ones selected for laying and for next year's breeders. These should be put into a larger house and run, and for an appreciable part of the day allowed to run free where there are water and shade; they will thus find a good deal of the food they require, but they should also be fed morning and night on a mixture of three parts of cracked mealies, seven parts of fine bran and five parts of green food chopped fine. If they cannot get insects or food in the water they have access to, they require 5 per cent. of some meat food added to this. Such treatment does not encourage laying, for we do not want them to commence till June; therefore make up the breeding pens about the 1st of May, and then feed for eggs as follows:—In the morning five parts of mealie meal, five parts of bran, one-and-a-half parts of meat of some kind, three parts of boiled potatoes, onions, turnips or pumpkins, etc., and three parts of cut green lucerne, cabbage or grass, etc., and in the afternoon some whole or crushed mealies in shallow dishes of water. Also see that grit, charcoal and oyster shell are always before them in shallow receptacles, also in water. As many as 25 ducks can be given to one drake in a breeding pen, provided they have plenty of exercise. Never let the ducks out before 10 a.m., otherwise they will lay away and the eggs are thus lost.

Ducks are subject to few diseases. Cramp and rheumatism are the most common, and these can be prevented by seeing that their sleeping quarters are dry. They are also subject to sunstroke, especially when young; the remedy is obvious, viz., keep them out of the hot sun. Another ailment, which goes by the name of "staggers," is caused by overcrowding and improper feeding, lack of ventilation, dirty houses and lack of drinking water. Properly treated, ducks are very hardy, and also very profitable. The secret of successful duck rearing is quick growth and quick returns. Kill and market at not less than ten weeks after hatching, and get them in that period by proper treatment and feeding up to 5 or 6 lbs. weight, then they pay well.

Poison Bait for Birds.

The Potchefstroom Experiment Farm reports:—

Our experiences have shewn the following to be the best method for destroying grain-eating birds:—

Obtain from the chemist one ounce of powdered strychnine alkaloid. Take two cupfuls of dry laundry starch or three large cupfuls of wheat flour, mix it with a little cold water, then add enough boiling water to make one-half gallon (three bottles) of paste and cook for a few minutes until the paste is clear, stirring continually. Then stir in the strychnine powder. Pour this poison paste over 40 or 50 pounds of small grain, such as kaffir corn, mix thoroughly so that every kernel of grain is coated with the paste. Then spread the grain out and let it dry. After being dried it can be kept indefinitely and used when desired. Fifty pounds is enough bait to last for a long time.

Burn small patches of ground and scatter unpoisoned grain on these. After it is found that this grain has been eaten, the poisoned grain can be used.

Caution: The patches of ground should be some distance from the house, otherwise the poultry may be killed. Remember to use great care in handling strychnine. It is very poisonous and dangerous, and a very small dose will kill a man.

Johannesburg Show.

The following is a list of Rhodesian successes in the maize classes at the fifth annual spring show of the Witwatersrand Agricultural Society, held at Johannesburg on the 8th and 9th September:—

COMMERCIAL CLASSES.

Ten bags shelled maize, suitable for export, and 10 ears from the same crop: Hickory King, high veld—1, T. H. Newmarch; 2, Mrs. E. Wilson. Low veld—1, Glanfield & Rattray. Any other variety white dent maize (open)—3, T. D. Maclean.

CHAMPIONSHIPS.

Ten bags Hickory King (open): T. H. Newmarch.

SEED MAIZE—500 BREEDING EARS.

Hickory King, high veld: 1, H. Kneiser; 2, J. Watson; 3, E. S. Klette. Low veld: 1, Glanfield & Rattray; 2, H. L. Newhook. Any other breed (open): 3, Department of Agriculture, Salisbury.

CHAMPIONSHIPS.

Five hundred ears Hickory King (open): Glanfield & Rattray.

Grand Championship: Glanfield & Rattray.

TWO HUNDRED BREEDING EARS SEED MAIZE.

High Veld Only.—Any variety white dent, except Hickory King: 3, G. Duthie.

Any other white dent breed: 1, T. D. Maclean; 3, H. B. Curling.

TEN BREEDING EARS SEED MAIZE.

High Veld Only.—Hickory King, 8-row: 1, E. S. Klette; 2, H. Kneiser; 3, Department of Agriculture, Salisbury. Louisiana Hickory, 10-row: 1, G. Duthie; 2, T. H. Newmarch. Texas Hickory, 12-row, or Salisbury White: 1, C. Southey; 2, Department of Agriculture, Salisbury; 3, T. H. Newmarch.

Low Veld Only.—Hickory King, 8-row: 1, Glanfield & Rattray; 2, Mossop Bros.; 3, W. E. Thurlow. Louisiana Hickory, 10-row: 2, A. R. Morkel. Texas Hickory 12-row, or Salisbury White: 1, D. W. Bean; 2, A. R. Morkel.

SINGLE BREEDING EAR OF MAIZE.

High Veld Only.—Hickory King, 8-row: 1, E. S. Klette; 2, J. Watson; 3, Mrs. E. Wilson. Louisiana Hickory, 10-row: 1, T. H. Newmarch; 2, G. Duthie. Texas Hickory, 12-row, or Salisbury White: 1 and 2, C. Southey; 3, Department of Agriculture, Salisbury.

Low Veld Only.—Hickory King, 8-row: 1, W. E. Thurlow. Texas Hickory, 12-row, or Salisbury White: 1, A. R. Morkel; 2, D. W. Bean. Any other white dent breed: 1, D. W. Bean; 3, A. R. Morkel.

In all, Rhodesia annexed 16 firsts, 13 seconds and 11 thirds; in the Hickory King classes all eight firsts were taken, as well as six seconds and four thirds.

These results speak for themselves, and leave no doubt as to the quality of maize that can be grown in this Territory. We tender our hearty congratulations to the exhibitors, and especially to Mr. G. Rattray, who has the unique distinction of winning the grand championship for two years in succession. It is worthy of note that there were some 26,000 cobs shewn, this number including 5,500 from Rhodesia and 500 from Portuguese East Africa. The cobs exhibited at the Salisbury show this year numbered 31,000 odd. Among the Union exhibits was the Potchefstroom Pearl, a recently produced and not quite fixed type; this is an attractive looking cob, but whether it would do well in Southern Rhodesia is difficult to say, although there seems no reason why it should not. Two varieties which might be suitable for our drier regions, where the growing period is shorter, are Botman and Red Cob Cango. They are old favourites in the Union, and are more useful for local consumption and for making silage than for export purposes.

The Cattle.—Though not successful in taking first place, Mr. Jobling's team of grade Herefords took a number of second prizes and were universally admired. Several entries of Lincoln Red fat oxen were debarred from entering owing to quarantine restrictions, but for which Rhodesia would certainly have taken a high place. It is to be regretted that there was no stall fed stock from Mashonaland, in spite of its favoured circumstances for winter feeding. The fifty head of veld fed bullocks sent by Mr. Morkel of Shamva, bred on Rhodesdale ranch, were too young, and lacked uniformity, breeding and condition, besides having travelled an enormous distance. Some old but very heavy Free State oxen took first place in this class.

At the bull sale following the show a number of excellent sires were purchased for Rhodesia, the number sent up within the week from Bloemfontein and Johannesburg considerably exceeding one hundred head, an index of the present demand and an indication of the rapid improvement in the quality of our cattle which is steadily going on.

LOW VELDT
200 BREEDING EARS
Grown in
SOUTHERN
RHODESIA

Sale of Live Stock on the Johannesburg Live Stock Market.

The following circular, issued by the Abattoir and Live Stock Market Department of the Municipal Council of Johannesburg, will be of interest to our readers:—

Live stock for sale may be consigned direct to the Director, Live Stock Market, Johannesburg, and will be sold by public auction to the highest bidder.

Consign to:—

Director,
Live Stock Market,
Johannesburg.

The railway consignment note may be marked "To Pay," and the amount of railage will be deducted from proceeds of sale.

Stock should be consigned so as to arrive in Johannesburg on Tuesdays, Wednesdays or Thursdays. Stock should not be consigned to arrive here on Saturdays, Sundays or public holidays.

Commission charged on sales is 4 % (four per cent.), which includes all market dues.

All slaughter stock sold on the market is sold with a Johannesburg abattoir guarantee, *i.e.*, in the event of any stock being condemned for disease in the abattoir, the buyer does not pay for these. To cover the vendor in the case of condemnation, all slaughter stock forwarded to the director for sale is insured, the full purchase price being paid out of the fund for condemned cattle, sheep and calves, and 3d. (threepence) per lb. dressed weight of carcase of pigs condemned.

Note.—The premium per head for cattle over 12 months is 1s. 6d., for calves under 12 months 3d., and for sheep, lambs and goats 2d. per head. For pigs up to 100 lbs. live weight it is 1s. 6d., and over this weight 2s.

The Council reserves the right not to indemnify any animal received in an emaciated condition or suffering from patent disease, or pigs shewing visible infection of measles.

As pigs are sold by live weight (with the exception of very small sucking pigs), a charge of 1s. per 25 pigs or part of 25 is made for weighing, and a weight certificate issued. All weighing of pigs is done by municipal officials.

There are two methods by which stock may be disposed of, which are as follows:—

(1) At so much per head "on hoof" in the live stock market by public auction.

(2) Slaughter of the animals and the sale of the carcases, hide, offal, fat, etc., separately.

If the animals are sold by No. (1) method, 4 per cent. commission on price realised covers all charges.

If the animals are sold by No. (2) method, the following are the abattoir and slaughtering charges, *in addition to 4 per cent. commission*:—

	Abattoir Charge.	Slaughtering Charge.
Cattle	2s. 6d. per head	4s. 9d. per head.
Sheep	0s. 6d. ,,	0s. 8d. ,,
Calves	1s. 0d. ,,	1s. 6d. ,,
Pigs	1s. 0d. ,,	1s. 6d. per 100 lbs. and 6d. for each 100 lbs. over.

In the event of a reserve price not being realised, the animals may be slaughtered, and the hide, offal, fat, etc., sold at once, and the carcases placed in the abattoir cold storage for sale at a later date, for which the charges would be as follows, in addition to 4 per cent. commission, and above mentioned abattoir and slaughtering charges:—

For every quarter of beef ...	1s. 6d. per week or part thereof.
Sheep carcase	0s. 6d. ,, ,,
Calf carcase	0s. 6d. ,, ,,
Pig carcase	0s. 6d. per 100 lbs. per week or part thereof.

All pigs forwarded for sale are examined before sale in the live stock market for visible infection of measles, and any found so infected are not sold or insured, but are forwarded to the abattoir to be slaughtered and dressed; the fat is then stripped off the carcase and sold on account of the vendor. In the event of this being done, the vendor is debited with abattoir and slaughtering charges as under:—

Abattoir Charge.	Slaughtering Charge.
1s. per pig	1s. 6d. per 100 lbs. and 6d. for every additional 100 lbs. or part.

In the event of any very poor pigs being found visibly infected, and from which no fat is available, they are destroyed without further charge to the vendor.

It is therefore advisable to examine all pigs for visible measles infection before sending for sale, and any found infected should not be forwarded.

A weekly report of prices ruling on the live stock market is published every Saturday, and farmers desirous of having these forwarded to them should make application to the director for their names and addresses to be entered on the mailing list.

The First Egg-Laying Test in Rhodesia.

The results of the above published in the *Agricultural Journal* for August were for the first thirteen weeks of the test, *i.e.*, from 21st April to 20th July. Particulars are now given of the output of eggs from 21st April to 7th September. Records, it will be seen, are being well maintained, and the results can be considered as very creditable indeed, especially in view of the fact that birds in several pens during the early part of the test went into moult, caused by change of surroundings, food, etc., on their arrival. This was especially marked in the cases of pens 4 and 5, while birds in pen 11 have been several times broody, but they were stopped as soon as was possible and brought on to lay again.

It will be noticed that quite a number of eggs weigh under the 2 oz. standard; this is especially noticeable in pens Nos. 8, 9, 14, 16, 17, 18 and 20, and the owners are advised not to breed next season from the birds which are laying these small eggs. On the other hand, the birds in some pens, viz., Nos. 4, 7, 10, 12, 13, 19 and 14 (the last-named having laid no egg under 2 oz.) have laid very few eggs under weight.

The birds continue in excellent health, and during the period from 20th July to 7th September there has been only one death, this being due to a ruptured ovum, which in about 99 cases out of 100 is fatal; this was hen No. 58, pen 12. She became ill on 6th August and died on 13th August, and was replaced by another on 18th August. The only other case of illness (and that only slight) was ulcerated mouth in hen 36, pen 8. She was taken out of her pen on the 5th September, treated, and returned cured on the 7th, and has continued laying.

The winter test of 16 weeks' duration concluded on 10th August, and the first three pens were as follows:—

1st A. Hampson, 394 eggs 2 oz. and over; 20 eggs under 2 oz.
weight, 53 lbs. 14 2-16 oz. 2 lbs. 5 1-16 oz.

2nd H. Tatham, 395 eggs 2 oz. and over; 13 eggs under 2 oz.
weight, 52 lbs. 3 15-16 oz. 1 lb. 7 10-16 oz.

3rd. A. E. Speight, 377 eggs 2 oz. and over; 24 eggs under 2 oz.
weight, 49 lbs. 8 oz. 2 lbs. 14 1-16 oz.

The weather has been hot, very dry and rather windy, but precautions have been taken to compensate for this in the way of food, etc., and thus the egg yield has been well maintained.

The test is creating a large amount of interest in the country, and is no doubt assisting in stimulating poultry keepers to greater efforts to make their poultry pay well. A large number of people have visited the test, and gained much useful practical knowledge thereby.

THE FIRST SOUTHERN RHODESIA EGG-LAYING TEST

21st April, 1920, to 2nd March, 1921.—Five Birds in each Pen.

Pen.	Position to date.	Owner.	Residence.	Breed.	21st April to 7th September, inclusive (20 weeks).			
					Total No. of eggs.		Total weight of eggs.	
					Above 2 ozs.	Below 2 ozs.	Above 2 ozs.	Below 2 ozs.
1	2	H. Tatham	Penhalonga	White Leghorns	476	49	63 lbs. $0\frac{13}{16}$ oz.	5 lbs. $11\frac{10}{16}$ ozs.
2	11	Mrs. Walleen	Bembesi	do.	361	43	46 lbs. $15\frac{4}{16}$ ozs.	4 lbs. $15\frac{4}{16}$ ozs.
3	1	A. Hampson	Salisbury	do.	477	27	65 lbs. $0\frac{14}{16}$ oz.	3 lbs. $2\frac{7}{16}$ ozs.
4	18	Mrs. Renton	Que Que	do.	263	6	35 lbs. $10\frac{10}{16}$ ozs.	$11\frac{9}{16}$ ozs.
5	9	A. R. Low	Gwelo	do.	378	33	49 lbs. $12\frac{7}{16}$ ozs.	3 lbs. $11\frac{6}{16}$ ozs.
6	15	W. Bands	Salisbury	Anconas	344	32	44 lbs. $0\frac{11}{16}$ oz.	3 lbs. $7\frac{13}{16}$ ozs.
7	17	Mrs. Lloyd	Inyazura	White Leghorns	269	9	37 lbs. $12\frac{6}{16}$ ozs.	1 lb. $0\frac{7}{16}$ oz.
8	20	W. F. Williams	Selukwe	do.	280	119	35 lbs. $0\frac{10}{16}$ oz.	13 lbs. $4\frac{1}{16}$ ozs.
9	19	Mrs. Kimpton	Umtali	do.	279	87	35 lbs. $10\frac{1}{16}$ ozs.	9 lbs. $7\frac{10}{16}$ ozs.
10	3	Mrs. Gibbings	Avondale	do.	442	1	62 lbs. 8 ozs.	$1\frac{4}{16}$ ozs.
11	14	H. Fretwell	do.	Rhode Island Reds	340	50	44 lbs. 10 ozs.	5 lbs. $11\frac{4}{16}$ ozs.
12	4	T. Brokensha	Umtali	White Leghorns	442	14	61 lbs. $3\frac{6}{16}$ ozs	1 lb. $10\frac{1}{16}$ ozs.
13	5	C. L. Brown	Salisbury	do.	457	4	60 lbs. $15\frac{2}{16}$ ozs.	$7\frac{3}{16}$ ozs.
14	12	J. S. Wreford	Bulawayo	do.	325	...	46 lbs. $9\frac{6}{16}$ ozs.	...
15	10	D. O'Linn	Salisbury	do.	367	40	48 lbs. $5\frac{3}{16}$ ozs.	4 lbs. $12\frac{7}{16}$ ozs.
16	6	A. E. Speight	do.	do.	450	60	59 lbs. $0\frac{12}{16}$ oz.	7 lbs. $1\frac{10}{16}$ ozs
17	16	Mrs. Williamson	Banket	do.	308	59	39 lbs. $1\frac{15}{16}$ ozs.	6 lbs. $13\frac{9}{16}$ ozs.
18	8	Bray & Bull	Umtali	do.	418	63	53 lbs. $9\frac{14}{16}$ ozs.	7 lbs. $2\frac{9}{16}$ ozs
19	7	Miss Greig	Bulawayo	do.	393	5	53 lbs. $11\frac{9}{16}$ ozs.	$7\frac{12}{16}$ ozs
20	13	Mrs. Deall	Old Umtali	do.	383	156	46 lbs. $5\frac{3}{16}$ ozs.	17 lbs. 6 [illegible] ozs.
				Totals	7,462	857	989 lbs. $0\frac{8}{16}$ ozs.	99 lbs. $2\frac{14}{16}$ ozs.

Southern Rhodesia Settlers' Board.

His Honour the Acting Administrator has been pleased to approve of the formation of a department to be known as the Southern Rhodesia Settlers' Board, of which the War Settlement Department will form the nucleus, with the addition of sundry local committees, the members of which will be appointed partly from the public and partly from the Civil Service.

The Controller of War Settlement will undertake the duties of secretary to the board.

The head office will be in Salisbury, and branch offices may be established from time to time in other centres as may be found necessary.

The duties of the board will be:—

(a) to get into touch with prospective farm settlers, and to supply them with information necessary to enable them to decide whether they will settle on the land, and (if so) what type of farming they will adopt;

(b) to collect and tabulate for the information of prospective settlers information relative to the extent, situation, character and value of farming and ranching land which may from time to time be available;

(c) to render such assistance to prospective settlers as may be necessary to enable them to view and locate land likely to suit their requirements;

(d) with the assistance of established farmers to obtain (when necessary) suitable tuition for settlers prior to their occupation of land;

(e) to endeavour to find suitable openings for such settlers as may have insufficient capital to enable them to start independently, but may be in a position to enter into a partnership or take up salaried employment;

(f) generally to assist settlers with advice and information.

Local committees may be formed in such centres as the board may think necessary. The number of members of such committees will not be limited, but should not as a rule exceed five.

The names of persons nominated to be members of local committees will be submitted by the board to the Administrator for his approval, and their appointment will not take effect until they have been so approved. When submitting names of persons to be members of local committees, the board will as far as possible be guided in their selection by the farmers' associations of the districts in which the local committees will operate.

Local committees will assist the board in carrying out its duties in so far as they shall concern the district in which each local committee operates. The limits of the districts will be decided by the board. The local committee will more particularly be required to interview and advise prospective settlers who may be brought to them by the secretary of the local committee or who come in touch with the committee otherwise.

The following have been appointed members of the board:—Messrs. Burton Ireland Collings, John Pascoe, Walter James Woods, Gerard Voltelin van der Byl, Emil Albert von Hirschberg, Duncan Black, John Arnold Edmonds, Hugh Godfrey Mundy, F.L.S., Hugh Wilbur Taylor, B.Agr., Charles Frederick Browning, William Hugh Williamson, Otto Christian Rawson, William Mathew Simpson, Walter Hill.

Review.

THE AYRSHIRE BREED.

We have received from the Argus South African Newspapers, Ltd., London, an illustrated book bearing the above title, issued by the Ayrshire Cattle Herd Book Society. We can without hesitation say that the book is the finest publication of its kind we have ever seen, and is a testimony to the enterprise and acumen of the society. No expense has been spared, and the book is profusely and beautifully illustrated. The letterpress is most comprehensive, and gives an interesting account of the evolution of the breed from an obscure past until the present day, when the Ayrshire is described as "Scotland's Dairy Cow." The characteristics of the breed are fairly and authoritatively stated, and the claim that the breed is exceedingly hardy and able to exist and thrive in exposed positions on scanty fare will be endorsed by many farmers in South Africa. The milk record movement and its effects are discussed and tables are given shewing the individual yields of pure bred Ayrshire cows.

An appendix gives a list of the leading Ayrshire breeders, with illustrations of the cattle bred at the different estates. The book is a most excellent production, and may be seen at the Department of Agriculture by anyone interested in the breed.

The Agricultural Outlook.

Farmers are busy breaking up their land for the ensuing season and hoping for seasonable rains. A good deal of land has already been turned under, and we would take this opportunity of emphasising the value of early ploughing wherever possible, thus enabling the land to obtain that weathering during the winter months which helps to liberate the plant food imprisoned in the soil.

Settlers continue to arrive by every mail, and a good many farms have changed hands during the last few months. Considerable interest is being taken in tobacco and cotton, and indications point to a large increase in the area planted to these crops next season. In regard to cotton, it was hoped to publish in this issue of the *Journal* particulars regarding the yields, costs of production and prices realised from the experimental plantings last season, but owing to neglect on the part of some growers to furnish returns complete data are not yet available.

Reports state that winter crops have done well, particularly wheat, and good harvests are expected. It is hoped to induce more farmers to grow wheat next season, and thus to make the country less dependent on outside sources of supply, which may at any time fail us. Our imports of wheat and wheaten flour for the first six months of the present year amounted to £47,290—a heavy item, and one which it is in our power to reduce very materially. There is a strong demand in South Africa for barley for malting purposes, and at the present time a representative of one of the leading buyers is in the country enquiring into the possibility of obtaining supplies in this Territory. The moist vlei land of this country, which is so suitable for the growing of wheat, is equally suitable for barley, which may afford an advantageous rotation with the former.

Veld fires, although not so prevalent as last year, are at the same time doing considerable damage. Various convictions have taken place, but in most cases it is a difficult matter to trace the culprits. There has been more systematic burning of fire guards this year, but it is surprising how many farmers neglect this elementary precaution.

The grass at this time of the year has naturally little nutriment, and this is where the benefit of the silage pit is appreciated. The erection of a creamery and cheese factory and the proposed establishment of a similar institution at Salisbury is stimulating interest in dairying. To those farmers who are contemplating the advisability of increasing their dairy stock the provision of winter feed is essential. The demand for dairy stock is very keen, and high prices are asked for good class animals. In some of the more favoured districts the young grass is making its appearance in the low lying parts, and cattle are picking up. In the Victoria district the frosts did considerable damage to the grass, from which it has not yet recovered. Generally speaking cattle are in fair condition, and losses from poverty should be few. Water supplies are good and should last out until the rains arrive.

Since the notice appeared in our last issue a great many applications have been received for seed for trial. In some cases the demand has been so great that the available supplies have already been exhausted, and the list published in this issue contains only those seeds of which a quantity remains for distribution.

Veterinary Report.

June, 1920.

AFRICAN COAST FEVER.

Gwelo District.—Only one case occurred at the infected centre, Hunter's Road.

Mazoe District.—At the infected centres the mortality was 14 head.

Melsetter District.—At the Tarka centre of infection the mortality was 10 head.

Matobo District.—A fresh outbreak occurred on Sauerdale Estate, where there were two deaths, from which the disease was diagnosed and confirmed microscopically. At the Figtree centre of infection the mortality was 42 head.

QUARTER-EVIL.

This disease is slowing spreading, nearly every district now being affected.

CONTAGIOUS ABORTION.

Outbreaks are reported in Salisbury and Umtali districts.

HORSE-SICKNESS.

Deaths have been reported, but mostly uninoculated animals.

SCREW-WORM.

Several cases have occurred in Matabeleland.

IMPORTATIONS.

From the United Kingdom:—Bulls, 7. From the Union of South Africa:—Heifers, 18; bulls, 42; horses, 343; mules, 97; donkeys, 48; sheep and goats, 978.

EXPORTATIONS.

To the Union of South Africa:—Cattle, 917; sheep and goats, 106; slaughter cattle *via* Bulawayo and Plumtree, 1,676; *via* Liebig's Drift, 616. To Northern Rhodesia:—Sheep, 75; horses, 15; mules, 18. To Belgian Congo:—Horses, 2; mules, 10; sheep, 75. To Portuguese East Africa:—Breeding cattle, 78; slaughter cattle, 213; horses, 2; mules, 2; donkeys, 13.

July, 1920.

AFRICAN COAST FEVER.

Gwelo District.—No fresh cases occurred at the infected centre, Hunter's Road.

Mazoe District.—At the infected centres the mortality was 7 head.

Melsetter District.—Ten cases were recorded at Tarka.

Matobo District.—The mortality was 22 head. No cases reported at the Sauerdale centre of infection.

QUARTER-EVIL.

This disease has made its appearance in the Makoni district.

CONTAGIOUS ABORTION.

Three further herds were found to be infected in the Umtali district.

HORSE-SICKNESS.

Only a few deaths reported; the season is practically ended.

TUBERCULOSIS.

A case reported in an animal for slaughter in Johannesburg.

IMPORTATIONS.

From the United Kingdom:—Heifers, 8; bulls, 3. From the Union of South Africa:—Heifers, 52; bulls, 29; horses, 287; mules, 10; donkeys, 99; sheep and goats, 990.

EXPORTATIONS.

To the Union of South Africa:—Breeding cattle, 1,476; slaughter cattle *via* Bulawayo and Plumtree, 1,512; *via* Liebig's Drift, 1,970; sheep and goats, 76. To Northern Rhodesia:—Horses, 12; donkeys, 21; mules, 4; sheep and goats, 135. To the Belgian Congo:—Pigs, 14; sheep and goats, 190.

C. R. EDMONDS,
Acting Chief Veterinary Surgeon.

Farming Calendar.

October.

BEE KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth, the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place. otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

CITRUS FRUITS.

Irrigation should be continued, followed by thorough cultivation, if no good soaking rains occur. From about the middle of this month to middle of next is the best time to plant orange trees, as they have hardened up their first growth, and if properly attended to will commence to grow right away, so that by the end of the growing season they will have put on considerable growth and established themselves well in the ground.

CROPS.

If ploughing has not been done earlier in the season, it should be undertaken as early as the rain will permit. A disc harrow or a roller should immediately follow the plough in order to break up the clods. In the case of new lands ploughed for the first time earlier in the season, an attempt should now be made to cross plough these. Permanent crops, such as Napier fodder or dhal, will require but little attention, except a light harrowing between the rows to maintain the mulch. It is not safe or advisable to plant any summer crops during this month. Winter wheats will be ready for harvesting, and the stubble should be ploughed in as soon afterwards as possible.

ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. See "Maize Stalk Borer," *Agricultural Journal*, December. 1917. Cutworms are very apt to be troublesome in the wet vleis. See "Cutworms," *Agricultural Journal*, August, 1918.

Tobacco.—Cutworms, stem-borer, leaf miner and other caterpillars are liable to give trouble in the seed beds. See "Tobacco Pests of Rhodesia," *Agricultural Journal*, February, 1920.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. See "Diseases of the Potato Tuber and Selection of Sound Seed," *Agricultural Journal*, February, 1914. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder) 1 lb. to 30 gallons of water, or (paste) 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb. Fresh water-slaked lime, 20 lbs. For cabbage aphis water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome the plants may be sprayed with soap wash or tobacco wash. Leaf eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started the damage is negligible.

Citrus Trees may be sprayed for scale after the fruit has set. Resin wash is the safest and most efficient spray. Fumigation is still more effective. Avoid using miscible oils for citrus spraying at this time of the year. Destroy out-of-season fruit on account of citrus codling moth. See "Rhodesian Citrus Pests," *Agricultural Journal*, February-April, 1916.

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste) 1 lb. to 10 gallons of water, or (powder) 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is more essential than at first thought, as in this state the soil when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull day or towards evening; the plants should be well watered before being removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

FORESTRY.

Prick out into tins any trees that are ready. If the ground is soft enough, harrow and cross-plough the land broken up in the early autumn.

POULTRY.

A bird if she is going to lay at all should be doing so now; any that are not should be killed for eating. The birds should be gone over individually, and the poor layers culled out. The method of distinguishing between the good and bad layers was clearly defined in the *Agricultural Journal* for December, 1919 (Bulletin No. 343). There are too many bad layers and unprofitable birds on farms and in poultry yards, and the owners are losing money on them. See that shade is provided for adult birds and young stock, especially the latter, and that their sleeping quarters are not hot and stuffy. The adult birds should have Epsom salts and Glauber's salts alternately every three or four days during the hot weather; for the young stock once a week is sufficient; the quantity is two good teaspoonfuls to every quart of drinking water. Once a week a little permanganate of potash in the drinking water keeps hot weather intestinal troubles in check. Keep a constant watch for insects during the hot weather, and dip the birds and spray the houses to keep these in abeyance. A good dipping solution is as follows:—One tablespoonful of Kerol, Hycol, Jeyes' Fluid or similar disinfectant to a paraffin tin of *warm* water. For a spraying solution:—Two tablespoonfuls of one of the above to a paraffin tin of *hot* water.

Keep all stock, young and adult, scratching for their grain; not a grain should be given but what has to be scratched for in deep litter; this is especially necessary in hot weather: it means more eggs, no illness, no deaths and strong healthy stock. Kaffir melons and pumpkins make excellent green food in hot weather if no other is available; don't be afraid of the seeds; it is erroneous to imagine they cause illness. To prove it the writer has fed fowls on nothing but these and water for four days without any ill effect.

STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded, if this has not already been done, and care should be taken that they do not suffer any serious set-back by reason of the want of veld. If calves are not desired in mid-winter, the bulls should be taken out of the herd now until the end of January. Care should be taken to provide a plentiful supply of clean water, and dipping must be regularly attended to.

Sheep.—If spring lambs are expected, one should see that the sheep shed is in order, and that there is a supply of hay, ensilage or mealies for the poorer ewes in the case of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient.

VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes should be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin, and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and mealies may also be sown this month.

VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, and it will only disappear when there is plenty of good grass on the veld.

WEATHER.

This is apt to be a hot dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner. The average rainfall in Mashonaland is from one to one-and-three-quarters of an inch; in Matabeleland one inch or so, and rather less in the Zambesi Valley. Generally speaking, the rain is more plentiful and earlier in the eastern districts, and takes the form of thunder showers at this time of year.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, otherwise serious loss may result.

November.

BEE KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must still be resorted to, in order to keep the trees in good growth and not allow any check to the fruit. This is the best month to sow beans or other seeds for ploughing in later as green manure. Sow about 75 lbs. of kaffir beans per acre, so as to cover the whole area with a green covering.

CROPS.

This month is one of the busiest on the farm. All the implements should be examined and put into order, particularly the maize planter, as a great many of the misses in the maize field are undoubtedly due to faulty planting. Seeds should be overhauled, and pea nuts intended for seed are best shelled immediately before planting. Planting and sowing will commence with the rains. Among the first crops to be sown are velvet beans (for seed), pea nuts, dhal, sunflowers and maize. Napier fodder roots may be divided for the first time if the rains will allow.

ENTOMOLOGICAL.

Maize.—Crops planted before the last week in this month are very liable to suffer later from stalk borer. Wherever practicable postpone planting until December. See "Maize Stalk Borer," *Agricultural Journal*, December, 1917. Red lands may be baited at the end of the month against surface beetles, snout beetles and other pests which reduce the primary stand of plants. See "Maize Culture on Red Soils," "Value of Poisoned Bait as an Aid to Good Stands," *Agricultural Journal*, April, 1919. Cutworms are not likely to attack the crop badly on red soil until December, but may be in evidence in vlei situations in November. See "Cutworms," *Agricultural Journal*, August, 1918. The black maize beetle will be in evidence on infested farms, but this pest has as yet been imperfectly studied. See "The Maize Beetle," *Agricultural Journal*, February, 1918.

Tobacco.—Practically all the enemies of this crop are apt to be injurious when it is newly planted out. See "Tobacco Pests of Rhodesia," *Agricultural Journal*, February, 1920.

Potato.—The first brood of the leaf-eating ladybirds commences in November. See "Two Ladybirds injurious to Potato," *Agricultural Journal*, October, 1913. Blue blister beetles are frequently a nuisance on sandy soils, and caterpillars may be troublesome. The potato tuber moth is apt to cause injury to the tops at this time of year. An arsenical spray, such as arsenate of lead or Paris green, can be used to check these pests.

Cabbage, Turnip, etc.—Diamond-back moth and webworm are the chief pests, though cabbage aphis may be in evidence (see under October). Liberal watering and washing the plants down regularly with a forceful stream of water from a hose or spray pump helps considerably against the cabbage aphis.

Beans and Peas.—As under October.

Citrus Trees.—As under October

Cucumbers, Marrows, etc.—As under October.

Deciduous Fruit Trees.—Chafer beetles may still be injurious (see under October). Choice varieties of early peaches may be netted as a protection against fruit-piercing moths.

Fig.—As under October.

FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this country :—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Eschscholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

FORESTRY.

Any young plants that are still in the beds should be pricked out into tins in the early part of this month. It is really rather late for this work. If the cross-ploughing and harrowing were not tackled last month, it should be done now.

POULTRY.

Watch for birds commencing to moult this month : if any start doing so, they should if possible be fed on foods as detailed in the Calendar for November, 1919 (*vide Journal* for October, 1919). Diseases caused by bacteria and bacilli are more prevalent during the months of October, November and December, and for these see *Agricultural Journals* for June and October, 1919. There should be no male birds running with the hens at any time except during the breeding season (viz., from March to the end of August), and especially should this be avoided during the hot season, for it is the cause of many bad eggs. We want no bad eggs in Rhodesia, but a reputation for good ones, especially when we commence to export, which should come shortly. Prepare for the rainy season ; see that there are no hollows near the houses to cause pools ; that the floors of the houses are well above the level of the surrounding ground ; that the roofs are water-tight, and that the birds will always be dry during the heaviest rain. It is only by attending to this that eggs will be produced in quantity ; therefore see to it now, and do not wait till the rains commence, for once the fowls get wet, the mischief is done. Remember that it is much easier for a fowl to stop laying than to bring her on to lay again. Never forget the grit, charcoal and clean water ; without them the birds produce few eggs and are sure to become ill and will probably die.

STOCK.

Cattle.—Normally rains will have fallen and the veld will be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or mealies daily. Dairymen will not require to feed much succulent food, and usually the more expensive protein foods may be considerably curtailed at this time, but good sweet hay and mealies will be found to be very beneficial to milch cows, even if the veld is very plentiful. Clean dry sleeping places for both cows and calves will pay handsomely for any extra trouble involved. Young calves do not need to walk far, and in wet weather are much best in a clean dry pen. Watch for ticks.

Sheep.—Keep the sheep on high dry land. Be careful to keep the ticks down. Be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out.

Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks, and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity.

VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunder storms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy down pours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows.

In an ordinary season the rainfall is from four to five inches, more in the east and less in the west and in our two great river valleys of the Zambesi and Limpopo. Before the rains commence, severe heat, trying on account of the strong winds and the dryness of the air, is likely to be experienced.

Weather Bureau.

Stations at which rain fell during July and August :—

	July.	August.
MASHONALAND—		
Bikita—		
Bikita	0.46	—
Chilimanzi—		
Chilimanzi	0.07	—
Driefontein	0.01	nil
Induna	0.06	nil

	July.	August.
Gutu—		
Tel el Kebir	0.05	—
Glenary	0.04	nil
Hartley—		
Carnock Farm	nil	0.05
Cringleford	nil	0.75
Inyanga—		
St. Trias' Hill	0.15	nil
Lomagundi—		
Darwendale	nil	0.09
Argyle Farm	nil	0.07
Talfourd	nil	0.09
Makoni—		
Monte Cassino	nil	0.37
Mazoe—		
Bindura	0.09	—
Kingston	0.01	nil
Ruoko Ranche	0.03	nil
Mazoe	nil	0.05
Mtoko—		
Mtoko	nil	0.15
Melsetter—		
Brackenbury	0.33	0.28
Helvetia	0.76	0.73
Chikore	0.37	0.24
Ndanga—		
Doornfontein	0.02	—
Ndanga	0.11	nil
Salisbury—		
Ardbennie	nil	0.10
Avondale	0.26	—
Bromley	nil	0.06
Gwebi	nil	0.10
Borrowdale	nil	0.03
Meadows	nil	0.01
Sebastopol	0.04	nil
Selby	nil	0.04
Western Commonage	0.04	nil
Salisbury Railway	0.10	0.28
Umtali—		
Hoboken	0.35	—
Premier Estate	0.05	0.04
Reservoir	0.38	—
Sarum	nil	0.02
Stapleford	1.36	0.31
Stralsund	0.39	nil
Odzi Drift	0.05	—
Odzani	0.01	0.04
Jichidza Mission	0.15	nil
Morgenster	0.24	nil
MATABELELAND—		
Belingwe—		
Sovelele	0.02	—

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1920		
			October	November	December
Bindura	Bindura	G. Askew	9	13	11
Bromley	Bromley	C. J. Shirley	7	4	2
Charter—Mgezi	Farmers' Hall, Beatrice	W. Krienke	28	25	30
Central	Umvuma	W. A. James	30	27	25
Darwin	Darwin	H. Wessels	10	14	12
Eastern Border (South Melsetter)	Helvetia	———	8	12	10
Eastern Districts	Good Hope Farm	J. Rademeyer	9	13	11
Enterprise	Various farms	R. Philip	6	3	1
Felixburg—Gutu	Felixburg	D. R. Pyewell	..	13	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	H. Charles	2	6	4
Gatooma	Gatooma	E. Seale	16	20	18
Gazaland	Chipinga	J. Myers	27	..	27
Greystone	Various farm houses, Shangani	M. Kerr	9	13	11
Hartley	Hartley	J. de L. Nimmo	23	27	25
Headlands	Headlands	J. Grewar	No	fixed	dates
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. W Twilley	9	13	11
Insiza—Shangani	Shangani	C. H. Lewis	16	..	18
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	9	13	11
Inyazura	Inyazura	H. B. Curling	20	17	15
Lalapansi	Lalapansi	B. J. Ingle	16	20	18
Lomagundi	Sinoia	J. G. Clarkson	23	20	18
Macheke	Macheke	W. L. McLean	No	fixed	dates
Makwiro	Makwiro	D. M. Syme	15	19	17
Makoni North	Makoni	J. G. Monckton	30	27	25
Makoni	Rusape	W. B. Tapson	9	13	11
Marandellas, Northern	Marandellas Farmers' Hall	J. Thackara	2	6	4
Marandellas, Southern	Inoro	J. Gibberd	6	3	1
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	6	3	1
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed	dates
Matopo Branch, R.L. and F.A.	Various farm houses	S. Gillespie	No	fixed	dates
Mazoe	Glendale Siding	Mrs. Yoxall West	13	10	8
Melsetter (North)	Various farms	R. Wodehouse	..	6	..
Midlands Farmers and Stockowners	———	———	8	12	10
Northern Umtali	Farm Summerfield	A. Tulloch	30	..	..
Norton and District	Norton Store	W. Wrench	2	6	4
Que Que	Que Que	E. J. Ross	16	20	18
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	8	12	10
Selous	Various farms	A. L. Douglas	16	20	18
Selukwe	Selukwe	E. E. Somerset	No	fixed	dates
Shamva	Shamva	Capt. N. Stanley Stallard	..	17	..
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	16	13	11
Umtali	Royal Hotel, Umtali	J. S. Holland	7	4	2
Victoria	Victoria	———	1	5	3
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	9	13	11

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc. ; and generally on all questions relating to live stock and to tillage operations.

Distribution of Seed for Co-operative Experiments.

Seed of the following summer crops is available for free distribution under the usual terms of co-operative experiments. Distribution will close on the 31st October.

Seed is supplied f.o.r. Salisbury in sufficient quantity to sow from one-quarter to one acre, according to variety, and not more than four varieties can be sent to any one applicant. All applications, together with full particulars regarding forwarding, should be addressed to the Agriculturist, Department of Agriculture, Salisbury.

Summer Cereals—Burt and Kherson oats, emmer, rice.

Oil Seeds—Linseed, sunflower, Spanish ground nuts.

Leguminous Crops—Velvet beans (common and white stingless), sunn hemp, dhal, vetches, beggar weed and lucerne (in small amounts for irrigated land).

Hay Crops—Teff grass, manna, Sudan grass.

Grazing and Green Soiling Crops—Kikuyu grass, Napier fodder, molasses grass.

Miscellaneous Crops—Buckwheat and field radish.

Farm Seeds for Sale.

The under-mentioned seeds grown on the Government experiment farms are offered for sale at the prices quoted. The quantities available are limited. Prices are f.o.r. Salisbury, or f.o.r. the Gwebi Experiment Farm. Grass roots will be distributed from the 1st December. Napier fodder will be sold in bags containing approximately 200 roots, but no guarantee can be given of the exact number contained in each bag.

On account of the limited supply available in some cases, it is impossible to guarantee the full delivery of any order. *Farmers are therefore requested not to enclose cheques until they are advised as to the amount of seed allotted to them.* The seeds are consigned carriage forward in the case of stations. In the case of sidings the amount of railage will be notified after despatch.

Ground nuts (Spanish), unshelled, 20s. per bag.
Manna, 4d. per lb.
Hickory King maize, 20s. per 100 lbs.
Salisbury White maize, 20s. per 100 lbs.
Napier fodder roots, 5s. per 100 roots.
Kikuyu grass roots (limited amount), 5s. per 100 roots.
Majorda melon seed, 1s. 6d. per lb.
Sunflower seed, 15s. per 100 lbs.
Linseed, white flowering, 6d. per lb.
Field radish, 2s. per lb.
Buckwheat, 2d. per lb.
Black-eyed Susan pea, 25s. per 100 lbs.
Sweet potato slips, 5s. per 100 slips.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE AND CROPS.

No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 106. Cultivation and Preparation of Ginger.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. G. Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops unsuitable to Southern Rhodesia conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.
No. 305. Manure Supplies, by E. V. Flack.
No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.
No. 320. Maize Grading, by C. Mainwaring.
No. 327. Linseed, by C. Mainwaring
No. 344. Ensilage, by J. A. T. Walters, B.A.
No. 351. Improvement of Rhodesian Pastures, by H. G. Mundy, F.L.S.
No. 357. Measurement of Land, by F. Eyles, F.L.S., F.S.S.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
Botanical Specimens for Identification.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-1919, by H. G. Mundy, F.E.S., and J. A. T. Walters, B.A.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.

TOBACCO.

No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.
No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.
No. 333. Tobacco Culture—Field Operations, by H. W. Taylor, B.Agr.
No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 339. Tobacco Culture; Harvesting and Curing, by H. W. Taylor, B.Agr.
No. 346. Tobacco Culture—Grading on the Farm, by H. W. Taylor, B.Agr.
No. 347. Tobacco Pests of Rhodesia, by R. W. Jack, F.E.S.
Handbook of Tobacco Culture for Planters in Southern Rhodesia, price 2s. 6d., post free outside South Africa 3s. 6d.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 348. Statistics of crops grown by Europeans in Southern Rhodesia for the season 1918-19, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan Government Veterinary Bacteriologist, Southern Rhodesia.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 255. Pound Fees.
——— Arsenite Cattle Dip—How to Mix.
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No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
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No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R W. Jack, F.E.S.
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No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.
No. 353. Further Experiments with Poisoned Bait on Maize Lands, by R. W. Jack, F.E.S.

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No. 273. Enkeldoorn Produce Express Syndicate Rules.
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No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 358. Notes on the Regulations governing the Sale of Fertilisers and Farm Foods, by E. V. Flack.
No. 360. Notes on the Rainfall Season 1919-20 in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Pisé de Terre Buildings, by A. A. Muir.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

F. L. B.—As pupil on a mixed farm. Similar experience in England for one-and-a-half years. Prepared to pay reasonable fees. At present living in England.

D. R. L. P.—Single lady as pupil to gain experience in stock raising. Experience in England in cheese and butter making. Resident in Rhodesia for six months.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 407 of 1920.] [6th August, 1920.

IMPORTATION OF CATTLE.

HIS Honour the Administrator has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notices Nos. 129 and 226 of 1918, and, notwithstanding any general restrictions on the importation of cattle, to make the following provision for the introduction of certain classes of cattle from the Cape Province, the Orange Free State and the Transvaal.

1. The following classes of cattle may be imported direct from the Cape Province, the Orange Free State or the Transvaal :—

   (1) cattle, irrespective of age, if entered in a South African stud book or appendix thereto, or cattle entered in a stud book which were originally imported from Great Britain or Ireland, the United States of America or the Kingdom of the Netherlands;

   (2) cattle, irrespective of age, if they have been in the owner's possession since birth;

   (3) cattle with not more than six permanent central incisor teeth.

2. (1) No importation of cattle as defined in section 1, sub-section (1) hereof shall be permitted until application for permission to import shall have been made to the Controller of Stock, Salisbury, or to the Chief Inspector of Stock, Bulawayo, in the form of Annexure "A," and until a permit shall have been issued by the Controller of Stock or Chief Inspector, which may contain such conditions as shall from time to time appear expedient.

(2) Persons desiring to import cattle of the class described in section 1, sub-section (2) hereof shall make application for permission to import to the Controller of Stock, Salisbury, or to the Chief Inspector of Stock, Bulawayo, and in such application shall state the number and description of the animals that it is desired to import, the farm and district in which they are located, and the name of the seller. Such application shall be accompanied by a certificate in the form of Annexure "B" hereto relating to such animals. The Controller of Stock or Chief Inspector may thereupon issue a permit to import such animals.

(3) Persons desiring to import cattle of the class described in section 1, sub-section (3) hereof shall make an application as in the last sub-section described, and thereupon the Controller of Stock or Chief Inspector may issue a permit to import such animals, subject to a certificate being furnished in the form of Annexure "C" hereto.

3. The importation of cattle from Great Britain and Ireland, the United States of America and the Kingdom of the Netherlands may be permitted under the following terms and conditions :—

(1) a permit shall be required from the Controller of Stock or the Chief Inspector which may contain such conditions as shall from time to time appear expedient;

(2) importations shall be through and direct from the ports of Capetown or Port Elizabeth.

4. All cattle imported in terms of these regulations shall be submitted to such examination or tests as the Controller of Stock or the Chief Inspector may direct. If such examination or tests disclose the existence of any destructive disease, the cattle shall be immediately destroyed and the carcases thereof disposed of in such a manner as a Government Veterinary Surgeon may authorise or require. The Controller of Stock or the Chief Inspector may permit of the age restriction and the tests aforesaid being dispensed with in the case of cattle in transit by rail to any place beyond the borders of Southern Rhodesia.

5. All expenses or losses incident to quarantine, examination, testing or destruction as aforesaid shall be borne by the owner of the cattle.

6. Any person introducing cattle in contravention of these regulations, or failing to comply with any of the conditions attached to permits to import, or furnishing applications, declarations or other necessary documents known to be false in any material particular, or failing to comply with all lawful directions as to quarantine, examination, testing, destruction or disposal of carcases, shall be liable to a fine not exceeding £20 for each animal in respect of which such offence shall have been committed, and in default of payment to imprisonment with or without hard labour for any period not exceeding six months, unless higher or greater penalties shall have been provided for such offences by the "Animals Diseases Consolidation Ordinance, 1904"; provided, however, that the penalties imposed by these regulations shall not exempt any cattle from destruction in terms of the aforesaid Ordinance.

No. 417 of 1920.] [13th August, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 299 of 1920, and in terms of section 17 of Government Notice No. 21 of 1917, to declare the following area of infection and guard area in lieu thereof:—

MELSETTER NATIVE DISTRICT.

(a) *Area of Infection.*

An area comprising the farms Glencoe, Hayfield, Mermaid's Grotto, Rumble Rills, Tarka, Springfield, Tilbury, Dunstan and Welgelegen.

(b) *Guard Area.*

An area comprising the Ingorima Reserve, the farms Forest Glade, Springvale, Orange Grove, Roede, Nyhodi, Nyaruma and Scott's portion of Thornton.

No. 446 of 1920.] [27th August, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notices Nos. 273 and 342 of 1920, and, in terms of section 17 of Government Notice No. 21 of 1917, declare the following areas of infection and guard area in lieu thereof:—

BULAWAYO, MATOBO AND BULALIMA-MANGWE NATIVE DISTRICTS.

(a) *Areas of Infection.*

1. An area bounded by and including the following farms :—Springvale, Tati Outspan, D'Hoop, Forwards; the eastern boundary of Forwards to the Ove River; thence down this river to the north boundary of Ove North; thence along the north-western boundary of Ove North, the northern boundaries of the farms Gummella, Undza, Mavuli and Store, the southern boundary of Famookwe to the Shashani River, Famookwe, Mount Francis, Warneford, Shashani, Hannayvale, Sergeants and Springvale "B."

2. Sauerdale, excluding Westacre Creek, Inyanden and Chabalala Farms.

BULAWAYO, MATOBO, BULALIMA-MANGWE AND UMZINGWANE NATIVE DISTRICTS.

(b) *Guard Area.*

An area bounded by and including the following farms :—Matjesumphlope, Douglasdale, Hope Fountain, Happy Valley, Glen Montagu, Inyorka, Boomerang, Merino Walk, Matopo Block, Matopo Mountains unsurveyed west of Matopo Native Reserve, Manyoni, Sibuntuli, Maleme, Alalie, Malundi, Malala, Matibi, Mount Edgecombe, Taylor's Block, Smiths, Vlak fontein, Mali, Horncastle, Greenfields, Stokestown, Hobart, Boolie, Goodluck, Stonehills, Marshlands, Wilton, Stratton, Kalanga, Elstobbs, Centenary Mission, Maritzburg, North Vreigevecht, Irene, Collaton, Wollendale Estate, Umganin and Bellevue.

No. 447 of 1920.] [27th August, 1920.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farm Sauerdale, His Honour the Administrator in Council has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to declare the following area to be actively infected with African Coast Fever for the purposes of the said Ordinance.

Description of Area.

Bulawayo, Matobo, Bulalima-Mangwe and Umzingwane Native Districts.

An area bounded by and including the following farms :—Matjesumphlope, Douglasdale, Hope Fountain, Happy Valley, Glen Montagu, Inyorka, Boomerang, Merino Walk, Matopo Block, Matopo Mountains unsurveyed west of Matopo Native Reserve, Manyoni, Sibuntuli, Malemo, Alalie, Malundi, Malala, Matibi, Mount Edgecombe, Taylor's Block, Smiths, Vlakfontein, Mali, Horncastle, Greenfields, Stokestown, Hobart, Boolie, Goodluck, Stonehills, Marshlands, Wilton, Stretton, Kalamga, Elstobbs, Centenary Mission, Maritzburg, North Vreigevecht, Irene, Collaton, Wollendale Estate, Umganin and Bellevue.

No. 405 of 1920.] [6th August, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of Applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
C. J. M. van Rooyen and J. H. van Rooyen	Sterkstroom	Charter	Farm Sterkstroom

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 444 of 1920.] [27th August, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of Applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
J. W. Sly ...	Luthe Spruit	Bulawayo	Farm Denver, Helenvale Nos. 8, 9, 10

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 461 of 1920.] [10th September, 1920.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
Mrs. O. G. F. Hone	Tatagura	Mazoe	Farm Mbebe

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 476 of 1920.] [17th September, 1920.

APPLICATIONS FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made. in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
C. A. Fawcett	Tatenkuku	Gwelo	Farm Rydal
H. Plumb	Whana	Gwelo	Farm Indiva

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of any of these applications, together with a full statement of the grounds for such objections.

No. 441 of 1920.] [27th August, 1920.

TSETSE FLY, MELSETTER DISTRICT: OPEN SHOOTING AREA.

IT is hereby notified that His Honour the Administrator has been pleased, under the provisions of the "Game Law Consolidation Ordinance, 1906," to suspend from date hereof the operations of sections 9, 10 and 12 of the Ordinance in respect of game as defined in Classes "B" and "C" of the said Ordinance within the following area in the Melsetter district :—

Description of Boundaries of Area.

From the south-west beacon of the farm Glencoe along the border of the Territory to the point where the Umzelezwe River crosses the border; thence up that river to the south-east beacon of the farm Smithfield; thence along the eastern boundaries of Smithfield and Grassflats and the southern and eastern boundaries of the farm Mirror to the Busi River; thence down the Busi River to where it intersects the south-eastern boundary of farm Hartebeest Nek; thence along the eastern boundary of Hartebeest Nek, the eastern and northern boundaries of Kenilworth to the south-east beacon of Groenvlei; thence along the eastern boundary of Groenvlei, the south and south-east boundaries of Clearwater and eastern boundary of Sterkstroom; thence along the southern boundaries of Heathfield, Albany, Bloemhof, Forest Glade and the western boundary of Glencoe to the point first named.

Field of Turkish Tobacco, Glenville Tobacco Plantation, Bulawayo, property of M. Pevsner, Esq. Mr. Pevsner is the largest, as well as one of the most successful, Turkish tobacco growers in South Africa.

THE RHODESIA

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

Compulsory Branding of Cattle.—A decree has recently been passed providing for the compulsory branding of all cattle in Mozambique territory under regulations to be carried out by the Veterinary Department. With the exception of the cattle belonging to the Mozambique Company, which are to be branded "C M," every owner of cattle in the territory will be provided with a brand, for which he will have to pay.

The Citrus Adviser.—Arrangements have been made for Mr. A. G. Turner, the Citrus Adviser, who is at present in England on leave, to proceed to California before returning to Rhodesia, for the purpose of studying the latest methods connected with the fruit industry. Mr. Turner is no stranger to California, for he was engaged there in fruit growing and packing for some nine years before coming to South Africa. California leads the world in regard to the fruit industry, and we feel sure that Mr. Turner will bring back with him knowledge that will be of the greatest value to the growers in this Territory.

The Small Holding in Southern Rhodesia.—Interesting information reaches us from Umtali regarding the possibilities of the small holding in Rhodesia. Mr. H. G. Franklin, a dairy farmer of Umtali, has a small farm of 31 acres, of which ten acres are irrigated. He relies upon the commonage for his grazing. During the last year on this farm he has grown 300 bags of maize, 65 bags of ground nuts, 3 tons of teff hay and 2 tons of cowpea hay. In addition he has green forage throughout the winter, and secures six to eight cuttings a year from his irrigated lucerne.

This would seem to establish a record for the small holding in Rhodesia, and is a fine example of what may be achieved by thorough organisation and good farming. Mr. Franklin favours Friesland cattle, and his foresight and energy in attending the last Bulawayo show and there purchasing two fine pedigree bulls of this breed are to be commended.

Islington Dairy Show.—A striking success was achieved by the Union exhibit of dairy produce at this show, which was held in London recently. It will be remembered that at last year's show South African cheese was awarded both first and second prizes against cheese exhibited by the other Dominions, and it was only to be expected that Canada, Australia and New Zealand would make a determined attack on the premier position obtained by South Africa.

The success of last year was, however, repeated, but in a greater measure. Not only did South Africa gain the gold, silver and bronze medals for cheese, but it also swept the board in the bacon, eggs and poultry classes, gaining a gold medal for each of these exhibits. The Union Government was finally awarded the gold medal as having the finest all round exhibit on the show.

This striking achievement has aroused much interest amongst wholesale firms in London, and it is authoritatively stated that a splendid market awaits all the dairy produce which South Africa can send.

Wheat.—We would draw attention to the comprehensive article dealing with wheat written by Mr. H. G. Mundy for this issue of the *Journal*. The matter is of great importance, for, as Mr. Mundy shews, we are at the present time only producing about a quarter of our requirements and the extent to which we are dependent upon outside sources of supply must give rise to uneasiness. The growing of wheat as a summer crop may be ruled out at present, for, in spite of exhaustive trials, no variety has been found sufficiently resistant to rust to warrant its being grown on a commercial scale. The solution appears to lie in the exploitation of the moist vlei land during the winter months and by irrigation. There are very large areas of these moisture-retaining soils in the Territory, and it is not too much to say that without any very great effort we could grow sufficient wheat to meet our own requirements.

It is to be hoped that Mr. Mundy's article will stimulate interest in this crop, which at present prices will give a remunerative return.

Poisonous Properties of Sunn Hemp (*Crotolaria Juncea*).—This leguminous crop promises shortly to become an extremely popular one for green manuring, even if not as a fibre crop. Many of the Crotolarias possess poisonous properties, however, and it was felt that more information regarding this aspect of Sunn hemp was desirable. The crop is grown extensively in India, both for fibre and in rotation, and enquiries were addressed to the Director of the Imperial Institute, South Kensington, London, soliciting information as to its reputation in India as a poisonous plant. There seemed, however, to be no definite knowledge on the point in question, though it was stated that the plant was said to have been fed without ill effects, while Mr. C. Dimmock, of Virginia, Lomagundi, who had experimented with Sunn hemp this season, on several occasions found his cattle on the lands after the crop had been reaped, apparently picking up and eating the fallen leaves and shed grain without suffering any injury.

In order, however, to decide the question definitely, it was arranged to carry out a feeding trial at the Gwebi experiment farm with Sunn hemp seed. For this purpose a sheep in good health was selected and fed as follows:—From 26th August with ¼ lb. of Sunn hemp seed per day for two weeks and shewed no ill effects; on 9th September the ration was increased to ½ lb. per day, and the beast very soon shewed signs of weakness and began to be tucked up. It also suffered very much from catarrh until it died on 20th September.

The test was not carried further at this time, but it is hoped to continue it next year. In its green state nothing appears to eat Sunn hemp, but cattle are not averse to it when dry. The poison is probably a cumulative one, and if only taken in small doses would probably not at first shew any harmful effects. Until more complete information is available, however, it is evidently advisable to take precautions to prevent stock having access to Sunn hemp lands until either the entire crop or the stubble has been turned under.

Useful Native Plant—*Pretrea zangue barica*, I. Gay.—Specimens of this somewhat common Rhodesian plant, better known, however, by its native names of Loledza (Mashona), Dereri (Manicaland), or

M'ginga ginga (Matabele), were recently submitted by this Department to the Imperial Institute for examination and report. By the Dutch the plant is known as Duivels-Dis on account of the sharp and thorny nature of the ripe fruits, and Mr. Burtt-Davy, writing in the *Transvaal Agricultural Journal* of October, 1906, reported that it was then of frequent occurrence in the sandy soils of the middle and bush velds of the Transvaal, where it was looked upon as an undesirable weed, owing to the crippling often caused to soft-footed stock by the ripe seed becoming imbedded in the hoof or foot.

Loledza is a prostrate trailing plant most common on our sandy soils, but also frequently seen on heavier land. Good drainage appears essential to it, and it may often be found on road sides, the banks of sandy washouts and railway cuttings. It grows in flat rosettes from a central root and produces long runners, which may stretch out as much as two feet or more from the crown. On these runners are borne pink or slightly mauve coloured tubular flowers, which, when seed is set, develop into roughly disc-shaped fruits, flattened on the under side and arched above. From the arched upper surface soft green thorns protrude. When ripe the entire seed is hard and brown and the thorns are exceedingly sharp.

Since the earliest occupation of Rhodesia it has been known that the natives prepared an emulsion from this plant which they used as an emolient in difficult cases of parturition and also as a drench to stimulate expulsion of the placenta. Not a few European farmers who have learned the peculiar properties of Loledza from the natives use it for similar purposes amongst their herds, while it has also been claimed for it that it possesses markedly antiseptic properties. The Manicaland natives are said to prepare a form of spinach from the young shoots.

The emulsion is obtained by steeping either fresh or dried stems and leaves in cold or warm water. A few minutes after immersion the material becomes mucilaginous and the water becomes oily or soapy to the touch, somewhat resembling diluted glycerine. Even with plants which have been dried for several years the effect is the same, though less marked than with fresh material. The bathing of the face in the liquid on a hot day has a wonderfully cooling and refreshing effect.

The plant is undoubtedly a useful home remedy for the purposes indicated, and in order to ascertain whether it had any commercial value material, as has been said, was submitted to the Imperial Institute, South Kensington, for examination. In the preliminary report now received the Director of the Institute states "that the plant does not contain either alkaloids or saponin, and no other definite constituent has been detected. It is, however, highly mucilaginous, and this fact would probably account for its use for the purposes indicated." If any readers can give further information regarding the uses, method of preparation and results obtained by using Loledza emulsion we shall be interested to receive it.

Barley for Malting Purposes.—The attention of farmers is once again called to the question of producing malting barley in Rhodesia. It may be remembered by some that prior to the war the South African Breweries, Ltd., endeavoured to promote interest in this crop by the issue of seed barley from the Castle Brewery, Salisbury, for trial. At that time, however, the growing of winter cereals on moisture-retaining soils was not taken very seriously, and the great possibilities which these soils offered for winter cereal production were not fully appreciated. With a wider settlement of the granite and sandstone areas, however, the matter of winter wheat growing is now receiving much attention, and it is opportune that an extensive market for malting barley should simultaneously arise.

Land which will grow winter wheat and oats will also usually produce winter crops of barley. At present a certain amount of Cape barley and barley wheat is grown—chiefly for green feed—but since barley generally yields more heavily than wheat, there is no reason why it should not prove equally profitable. In most of our wheat crops a few volunteer plants of barley may be seen, and these almost invariably head out well.

The Chevalier, or two-rowed barleys, which in Europe are in most favour for malting purposes, have not generally proved good yielders in Africa, and the type likely to be grown here will be the six-rowed barleys. It should be remembered, however, that the hulless barley, known as barley wheat or Nepal barley, is unsuitable for malting.

The climatic conditions under which our winter cereal crops are grown are specially favourable to the production of a very high class malting barley, and Rhodesia grown samples have been reported as equal to the best grown elsewhere in South Africa.

The South African Breweries, Ltd., have again taken up this matter, and are prepared to purchase very large supplies of barley. Production in Rhodesia does not yet warrant the erection at the Castle Brewery, Salisbury, of a malting plant, but we are informed that as soon as local production reaches two thousand bags annually a malting floor will be installed. Meanwhile such Rhodesian barley as is produced can be sold to the South African Breweries, Johannesburg. The price which they hope to offer will be the ruling market price realised in the Louis Trichardt district of the Transvaal, plus a bonus for parcels of 100 and 200 bags, while in order to encourage barley growing and assist farmers in marketing their crops until such time as the grain can be malted in Salisbury, the General Manager of the Beira and Mashonaland and Rhodesia Railways has agreed to quote a specially low rate for this commodity. This rate is 50s. per ton from Rusape or intermediate stations to Mafeking, no surcharge, while the rate from Mafeking to Johannesburg is 12s. 6d. per ton inclusive of surcharge but not of cartage. These rates are subject to full truck loads, minimum eleven tons in the case of trucks which cannot hold the full marked weight. The total through rate will thus be 62s. 6d. per ton in full truck loads. The South African Breweries, through their Salisbury branch, are prepared to supply seed barley to intending growers, and we should advise all those who wish to secure seed to communicate at once with the

Manager, Castle Brewery, Salisbury, stating the acreage which they propose to put down to barley and the quantity of seed they will require The normal rate of sowing will be about 60 to 70 lbs. per acre.

Since the above was written, Mr. H. E. Wood, the representative of the South African Breweries, has arrived in Rhodesia and has toured the Beatrice and Enkeldoorn areas, accompanied by Mr. J. A. T. Walters, Assistant Agriculturist. He has already received orders for upwards of 90 bags of seed barley, and it is anticipated that the seed will be supplied from the Salisbury Brewery. At the time of going to press Mr. Wood is visiting the Marandellas and Rusape districts on the same mission with Mr. H. G. Mundy, Chief Agriculturist. Mr. Wood has also visited farms in the Enterprise and Salisbury districts, and will later proceed to Umvuma and Felixburg. He expects to be in Rhodesia until about the middle of December, and communications can be addressed to him care of the S.A. Breweries, Salisbury.

Wheat in Rhodesia.

By H. G. MUNDY, F.L.S., etc., Chief Agriculturist and Botanist.

During the last twelve months farmers throughout Rhodesia as a whole, and more especially those on sand veld farms, have evinced considerable interest in the very important question of wheat growing. The fact has long been recognised that excellent wheat crops can be raised in this country during the winter months, either under irrigation or without irrigation on moisture-retaining soils, but expansion in production has been slow; and indeed it is not too much to say that wheat has not until quite recently been treated seriously as a commercial crop. The chief reasons for this were the following:—(a) The lack of local flour mills, which restricted the market for wheat to the comparatively small amount of Boer meal annually consumed, and which left the country dependent upon importation for its wheaten flour requirements; (b) the preponderating interest in tobacco growing amongst the majority of farmers on the sand veld; (c) the comparatively small acreages of irrigated land; (d) the fact that, there being no Government experiment farm on sand veld or with irrigation, this Department has been unable to demonstrate the possibilities of wheat growing either under irrigation or on soils naturally retentive of moisture. The first of these disabilities has now disappeared, and there are sufficient flour mills in Rhodesia to-day to mill all the wheat required for local consumption; at the same time the effects of the war have caused a considerable rise in the price of wheaten products, with the result that while these prices hold wheat is proving an extremely profitable crop. A third factor responsible for the increased interest in wheat is the rapid settlement of the sand veld farms, which are mostly not adapted to maize growing on a large scale, but which naturally lend themselves to dairying and mixed farming, and many of which possess magnificent possibilities for wheat growing.

Wheat Production in Southern Rhodesia.—The following figures, supplied by the Statistician, will serve to indicate the progress of wheat production for the last few years:—

Year.	Imported into Southern Rhodesia.	Re-exported from Southern Rhodesia.	Imported wheat consumed in Southern Rhodesia.	Grown in Southern Rhodesia.	Total consumed in Southern Rhodesia.
	lbs.	lbs.	lbs.	lbs.	lbs.
1914-15	6,983,329	345,925	6,637,404	1,266,517	7,903,921
1915-16	7,395,249	291,706	7,103,543	1,391,200	8,494,743
1916-17	7,060,703	286,013	6,774,690	1,806,200	8,580,890
1917-18	6,633,073	296,655	6,336,418	2,008,200	8,344,618
1918-19	6,791,862	413,748	6,378,114	2,099,800	8,477,914

From these figures it will be seen that taking an average of the last three years local production has totalled about 10,000 bags annually. On the other hand our total local consumption of wheat and wheat products in 1918-19 was equivalent to about 42,000 bags. Thus, allowing for an increase of 10 per cent. in the current year's wheat production, there is still a further 31,000 bags of wheat required annually before local production equals consumption, and even when this is achieved, there are always the Union markets and the rest of the world in which to dispose of any surplus there may be.

As regards prices, there seems no likelihood of any serious fall for some time to come. Owing to the unsettled state of affairs in the chief wheat-producing areas of Europe, production is not likely to reach the pre-war standard for a considerable time, and even if and when prices do come down there should still be a good margin of profit to the Rhodesian wheat grower, especially where the crop can be grown without irrigation. For, apart from the need of manure and the cost of irrigating, winter wheat is a cheaper crop to produce than maize. Once the seed is in the ground, practically no cultivation is necessary to keep down weeds, and only perhaps one rolling and harrowing to conserve moisture. The reaping by machinery is also a cheaper and quicker process than the hand reaping of maize.

Summer Wheat.—Owing to rust wheat as a summer crop has been found to be too uncertain. Much work has been done on the two experiment stations in introducing and growing on a commercial scale many varieties of wheat introduced from all parts of the world, while simultaneously a certain amount of wheat breeding has been carried on. In several instances varieties of great promise have been found, and have produced good summer crops for one or two seasons, thereby leading to the hope that a reliable variety for summer cropping had been secured. In every case, however, it has only been a question of time before these varieties succumbed to rust. Full well as the importance of a summer wheat for Rhodesia is recognised, it is not felt that any

Zwaart Baard Wheat (irrigated). Mr. De Meyer's farm, Aberdeen, Inyanga.

Boer Oats on sandstone vlei soil, Beatrice district.

variety yet tested can be recommended for use on a commercial scale. This result agrees with those arrived at in other parts of the world where similar rust problems are being studied, and it has been decided therefore to discontinue work on summer wheats until such time as it is possible for this subject to receive the undivided attention which its importance warrants.

Rust in Winter Wheat.—Although rust is the limiting factor as regards summer wheat, it is not, throughout the greater part of Southern Rhodesia, where dry winters are experienced, a serious menace to winter crops. In certain cases, as for instance in Melsetter district, where winter mists are prevalent, wheat is liable to rust, and some injury may be caused by it, but, generally speaking, the grower of winter wheat need not anticipate any serious danger from this cause.

Injury by Frost.—Although Rhodesia is subject only to comparatively light frosts, these, if occurring when the wheat is in flower, will result in very much reduced yields or even entire crop failure. It is only at this stage, however, that the crop is susceptible to this injury, and it is avoided by determining the date of seeding in accordance with the climatic conditions of the district. In most districts where frost occurs it may be expected from the end of May or middle of June until the latter part of August. Seeding is therefore regulated, or the crop is retarded in such a way that it will not come into flower until danger of frost is past.

Wheat under Irrigation.—The general methods of wheat culture under irrigation are similar to those which will be followed when the crop is grown without irrigation on moisture retaining soils. It is of great importance, however, that irrigated lands should be levelled and terraced as far as possible. This reduces the amount of water required, checks soil erosion and enables the crop to be watered more evenly and thoroughly. Wheat requires a firm and well prepared seed bed. Good results cannot be expected from ill-worked, cloddy land. Improper preparation of the soil in many cases is the direct cause of low yields. On such lands seed is covered at varying depths—some too shallow, some too deep. This results in uneven and weak germination, followed by sparse stands and uneven ripening.

Very seldom should the summer cropping of winter wheat lands be attempted except when catch crops are used with a view either to effecting a rotation with legumes or to ploughing under the entire crop. Any other form of summer cropping may render it exceedingly difficult to have the land ready for seeding to wheat in April or May. With irrigated soils, especially those of a heavy character, care must be taken not to work the land when too wet. Usually land which has been summer cropped must be irrigated before the seed bed for wheat can be prepared. There is frequently a tendency in such cases to plough before the land has dried out sufficiently. This results in "poaching" and the formation of hardpan and clods, which spoil the soil texture.

Wheat is almost invariably benefited by rolling and drag harrowing after germination. This promotes tillering and stooling and stimulates growth. Here again irrigated land must not be harrowed or rolled until the surface is reasonably dry, or more harm than good will result. The spike harrow and roller may be regarded as essential to the successful wheat grower.

The quantity of water required to raise a crop of wheat is governed by the texture of the soil and sub-soil and by the climatic conditions. Generally speaking, three to five waterings are required; the greater number if the land must be irrigated before seeding. On most soils, where the land is terraced into beds and with a good leading stream, each watering will call for roughly 70,000 gallons of water per acre. Considerably more will be needed if the leading stream is weak and the land has not been well terraced and laid out in comparatively small plots. Moisture is particularly necessary at germination time, when the crop is piping or shooting into ear, and again when the plants are in flower and the grain is setting. These are the critical times, when the lack of moisture will seriously reduce the yield. Once the grain is set and the ears turning yellow in colour no further watering is required, and if given will only retard ripening. Irrigated wheat can be grown on almost any class of soil—sand, sandy loam, red "formation" soils and so forth. Land which requires manure to grow a crop of maize will normally need similar treatment to produce a good crop of wheat. Excessively rich black peaty soil is not usually suitable for wheat, as on it the plants frequently fail to set grain. Such land will often grow good crops of barley and oats for forage, and can be tamed in this manner or may be cropped for a few years with maize before being put down to wheat. It is not advisable to sow such land with wheat on any large scale until it has been first tested on a smaller scale. Such soils, however, whether under irrigation or not, are most valuable for putting down to winter cereals with a view to providing grazing for sheep or dairy cattle from May onwards.

Vlei Wheat, or Wheat without Irrigation.—In some countries this might be referred to as *dryland* wheat, but in Rhodesia the term would be somewhat misleading, since, when irrigation is not available, it is usual to select vlei or naturally *moist* soils for the winter crop. Although the acreage of land brought under irrigation is yearly increasing, much of it is likely to be used for other purposes than cereal growing, and it would seem that the future expansion of wheat production in Rhodesia will be achieved rather by the intelligent use of the moisture retaining vlei soils than through the increasing acreage of irrigated wheat, though this also in certain districts will play its part.

The greater part of Rhodesia is what is known as sand veld country, derived either from granite or sandstone formations. Throughout the granite areas which comprise the great bulk of Rhodesia and in the districts favoured with a more generous rainfall, the granite vlei which remains moist a few inches below the surface throughout the entire dry season is a noticeable feature. In the sandstone areas similar and often much more extensive vleis are to be found, while in some districts even well up on the ridges the soil after a year of normal rainfall remains moist throughout winter. Such land is at present only valuable for early grazing—the moisture hastening spring growth after burning. By Christmas, owing to the coarse wiry nature of the grass, it generally becomes useless, since cattle prefer the sweeter grasses on better drained land, and will not return to the vleis until they have once again been burnt off. At the height of the rains these lands are generally too wet for any crops except rice. Their most characteristic vegetation as virgin veld, apart from grass, is the waterboom tree and waterberry bush (*Eugenia spp.*), while, when ploughed, they rapidly become infested with the blue-flowered lobelia. Where these trees and plants are of frequent occurrence, the land will usually be sufficiently retentive of moisture to produce, without irrigation, some winter cereal crop which can be utilised for grain production, green fodder or grazing. Varying sized blocks of such land are to be found on probably nearly three-quarters of the farms situated in the better watered sand veld districts, and the wonderful asset of these to the country is far too little appreciated. The soils of the Karoo and other extremely dry regions are proverbially fertile, but without irrigation they are not capable of growing commercial crops. Moisture is the governing factor in plant life, and without it, no matter how fertile the land may be, the staple crops of the world cannot be grown. The Rhodesian sand vlei soils are not rich in plant food, but many of them do retain the necessary moisture to grow winter crops without irrigation, and it is not difficult to build up fertility and supply plant food.

Preparation of the Land.—Owing to excessive wetness in summer, some of this land is difficult to handle, and in all cases its precise behaviour and best method of treatment are impossible to foretell until it has been ploughed. Wet land is naturally sour land, and the longer it can be broken up before seeding the better. Splendid crops of wheat have been grown this season on land which six months before seeding was raw, water-logged veld; but when possible, new land should be broken up at any convenient time during the previous dry season. It should be disc-harrowed, or if necessary cross-ploughed, as soon as dry enough in March or April. Old land on which wheat has already been grown is probably best ploughed immediately the wheat is off and left rough during the wet season. The important fact to remember in handling these soils is that ploughing after the rains are over releases moisture which may later be needed by the crop. The object, therefore, should be so to work the land that only a disc-harrowing or light skimming with the plough to destroy surface weeds and prepare a seed bed will be necessary after the rains have finished and prior to seeding.

There will usually be considerable variation in the wetness of the land, dependent upon the season and the drainage in each particular site. To cope with this, knowledge and experience of the land in question are necessary, and the best results cannot be expected until this has been acquired. On these soils, nature is doing for us what in other countries is effected by dry farming, and by applying the principles of dry farming in seasons of light rainfall much can be done to increase the maintenance of moisture and to secure a more even distribution of it throughout the field. In droughty years the acreage capable of raising a full crop will doubtless shrink, and after wet seasons it will expand again, but the labour and cost of preparing and seeding the land need never be wasted, for at worst that portion of the crop not likely to yield a remunerative return of grain can always profitably be utilised for green fodder or grazing.

Manuring.—Strong red and black soils will not generally at first require manure, but the usual experience has been that in the majority of the granite and sandstone soils profitable crops of wheat can hardly be raised without previously manuring the land. Artificial manures have not as yet been used to any extent, and it is usually kraal manure that is applied. The question of manure supplies is regarded by many as another of the limiting factors in wheat production, but by adequately bedding down live stock in the kraals with grass and wheat straw much may be done to increase the quantity and quality of kraal manure made. Heavy dressings are neither necessary nor desirable, as they encourage an excessive growth of straw. Five to eight tons of manure per acre is the usual dressing, and this should be applied and well incorporated with the soil before the seed is sown. Such dressings have been found to maintain moderate fertility in the wheat lands for two or three years. Whether it is better to apply the manure in October or November, or to wait until the rains are over and then apply, is not yet determined. October and November dressings are liable to suffer considerable wastage of plant food, and to result in luxuriant weed growth which may be difficult to turn under without deep ploughing. On the other hand, March or April dressings may not become sufficiently incorporated in the soil and rotted for the plants to make the best use of the manure. Cave guano as now placed upon the local markets is also likely to prove a suitable substitute when sufficient dung is not available. Dressings of 200 to 300 pounds per acre broadcasted are deserving of trial, though as yet the writer is not aware of any cases where this manure has been used in Rhodesia for wheat. Similarly any artificial fertiliser which has been successfully used on the farm for maize is also worth trial. Nitrates and phosphates are the two plant foods most generally needed.

Many of the sand veld soils are actually deficient or become rapidly exhausted in organic matter or humus. It should be possible to supply this by green manuring with any suitable bean crop or with Sunn hemp or Niger oil. It should be remembered, however, that ample time must be allowed for the green manure crop to rot before the wheat is sown. For this reason Sunn hemp—a very quick growing crop—is likely to prove one of the most suitable. On vlei soils it could probably be sown broadcast and disced in immediately the wheat is reaped, and in about two months should have made sufficient growth to be turned in before the land becomes too wet to work. When the Sunn hemp is about two to two and a half feet high appears the best stage of growth for ploughing under. Care should be taken not to green manure in excess. Too much organic matter in the soil will result in a coarse, weak growth of straw, which is to be avoided, and may indeed lead to barren ears, such as have been referred to as occurring on black, peaty soil. If green manuring has been practised, thereby supplying nitrogen and humus, a light dressing of some phosphatic manure such as superphosphate or phosphatic guano will probably be found to be beneficial, and should be broadcasted on the land prior to sowing.

Gluyas Wheat on granite vlei land. Mr. Harris' farm, Carnock, near Salisbury.

Gluyas Wheat (not irrigated) on granite sand. Mr. P. Webb's farm, Iron Mine Hill.

Gluyas Wheat (not irrigated). Mr. I. Krienke's farm, Beatrice district.

Gluyas Wheat (not irrigated), sandstone soil. Mr. Morgan's farm, Charter district.

Varieties most Suitable.—Just as with the best methods of handling the land, so as regards varieties there is much to be learnt. Many different varieties have been issued by this Department during the last ten years, and of these Early Gluyas is the most popular survivor and most widely grown. Other varieties frequently seen and well reported on are Els Koren, Klein Koren, Holstrooi Golden Ball, Wol Koren and Zwart Baard. Early Gluyas is usually regarded as the hardiest variety, while Klein Koren, though requiring the best land, produces the best quality grain. This variety, however, is probably more suited to growing under irrigation than without. The Wol Korens are disposed to suffer from rust. Generally speaking, it may be said that a moderately early wheat, maturing in about five months, is best for all purposes, as this enables the crop to be reaped before the rains break. Yellow Cross, a variety which has promised well as a summer crop, and matures in about three to four months, may prove useful on soils less retentive of moisture, while late wheats, such as Riette and the English varieties, are usually unsuitable. Any of the medium early varieties popular in other parts of South Africa may be expected to do well here, and, unfortunately, so much has this been the case, that almost all the wheat crops in the country to-day are very badly mixed, and consist of several different varieties. Growers should take notice of this, and, while using every effort to secure pure seed for their immediate needs, should select and isolate small stands of the best strains at present represented in their crops. By doing this it can be ascertained which variety is proving most satisfactory, while at the same time pure seed can be obtained.

Time and Method of Sowing, and Amount of Seed Sown.—If sown too early the crop is liable to be caught by frost when in flower, while if sown unduly late the land may either be too dry to give a good germination or to carry the crop through, or again the wheat may be delayed in ripening until after the rains break. The most suitable date for all districts appears to be from the middle of April to mid-May, though good returns are reported from sowings as late as the end of May or even later.

In the past there has been an excessive tendency towards thin seeding, and this has frequently led to poor yields and very uneven ripening. If the crops were grown on unmanured land, thin seeding might be justified on the drier soils, but when manure has been applied it is necessary to adopt moderately heavy seeding in order to secure a maximum return. As little as 25 to 30 pounds of seed per acre is often used, but better crops invariably result from a heavier seeding, and from 50 to 60 pounds weight of seed per acre is recommended. Rather less can be used if the seed is drilled.

The usual method at present is to broadcast the seed and plough or harrow it in. Both these methods entail covering the seed very unevenly, and there is no doubt that where the acreage to wheat is sufficiently large to justify the cost of a drill better results will be secured by drilling, when the depth of seeding can be regulated. Failing a drill, the land should be worked to a good tilth and the seed be broadcasted and disced in with a disc harrow. This implement will cover more evenly than either a plough or spike harrow, but the drill is obviously better, especially on unirrigated land, since with it the seed can be planted deeper and below the surface mulch of dry soil.

Subsequent Cultivation. As has been said, most wheat crops will benefit from rolling and harrowing at the time the plants are beginning to tiller or stool. This is particularly desirable when the crop is grown in sandy soils without irrigation. In such cases the working of the land to prepare a seed bed of necessity liberates moisture from the surface soil, since the natural surface mulch is broken. Rolling, by compacting the soil, will promote the action of capillarity and will raise the moisture from the lower soil layers to the surface soil, thus bringing it into the area in which the plant roots are feeding. To check undue evaporation, however, the roller must be followed by the light harrow or hallock weeder in order to break the crust and re-form the surface mulch. In most cases one rolling and harrowing after seeding and a subsequent one when the crop is beginning to tiller or stool will be sufficient.

Yields per Acre.—The average acre yield of wheat throughout the country is not more than three to four bags, but, as has been mentioned, thin seeding and lack of manuring are often accountable for this. Many farmers, on the other hand, have obtained returns of from six to eight bags per acre, the net normal weight of a bag being taken at 200 pounds.

Harvesting and Threshing.—A prevalent difficulty is that of reaping and threshing large crops of wheat without adequate machinery and the high cost which the purchase of such machinery at present entails. Reaping by hand is a slow and tedious process, and the threshing of any large amount of grain with a hand thresher is exceedingly laborious. A considerable acreage under wheat is required in order to justify the purchase of machinery, but it would seem that more might be done between neighbours in the purchase of machinery on a co-operative basis. Just as was the case with maize, as production in a district increases, so will the people be forthcoming who will introduce and work large travelling wheat threshers; but this will not overcome the question of reaping. At present the crops are reaped either by hand, with a mower with a reaper attachment, with a reaper and binder, or with a Sunshine harvester or stripper. The mower with reaper attachment is the cheapest machine, but its work usually leaves much to be desired. The reaper and binder is of course a popular and well proved implement, but is expensive and needs careful attention and knowledge of its working in order to maintain it in proper order. As far as is known there is as yet only one stripper in the country, but this, though an old machine, is said to be doing very satisfactory work. The advantage of the stripper is that it simultaneously reaps the ears and shells the grain in one operation. Its disadvantages are that for it to do good work the crop requires to be dead ripe and that the straw is left uncut on the field, and in order to be utilised in the kraals must be subsequently cut with a mower. The current prices for these implements are approximately as follows:—Mower with reaper attachment, from £45 to £55; reapers and binders, considerably more; and strippers.

about £200 landed Rhodesia. Such machinery is at the moment rather scarce, and though several firms have these implements on order, few are able to quote for immediate delivery. Small crops can be threshed out with sticks or flails, or can be trodden out by cattle in the old Biblical style, but with larger crops such methods are not practical. At present there are one or two types of hand threshers on the market, of which the most commonly met with are the "Little Gem" and the "Tiny" threshers. These small machines have no great daily capacity, but can be used until such time as larger machines are introduced into a district. Their present cost is from £25 to £30. In the Mazoe district wheat has been successfully threshed by an ordinary power maize sheller. After threshing, the grain requires to be winnowed, which can either be done by hand or by means of any recognised winnowing machine. All such methods are, however, somewhat primitive, and when any considerable acreage of wheat is being grown in a district the introduction of up-to-date reaping and threshing machinery either by private enterprise or on a co-operative basis is deserving of careful consideration. Until such machinery is available, the expansion of the wheat industry must be much retarded.

Diseases and Pests.—As has already been stated, rust is the most important disease to be anticipated, but in normal seasons no serious damage from this to winter crops need be feared if due attention is paid to the correct date of seeding and choice of variety. Other diseases are smut and white ear or deaf ear, and of these the latter is apparently usually caused by frost or by growing the crop in excessively rich land. Occasionally it may be caused by insect pests, but no definite report of white ear arising from this cause has yet been received, so that the white ear as generally found in Southern Rhodesia cannot yet be classified as a disease.

Smut, which is prevalent in all wheat, barley, oat and rye crops, annually causes heavy losses of grain, and should always be guarded against. In place of healthy grain the glumes of the ears become filled with a black soot-like powder. The spores are carried on the seed, and seed taken from an infected crop usually gives rise to an even more smutted crop the following season. Treatment, however, is extremely simple and effective. The commonest remedies are either blue stone (copper sulphate) or formalin or formaldehyde. The former is the older remedy, and the solution generally used is one pound of copper sulphate dissolved in 22 gallons of water—the crystals being first crushed and then dissolved in hot water, which is subsequently diluted to the required strength. The grain may either be immersed in this solution overnight, or may be sprinkled with it, well turned and then allowed to stand overnight in heaps, after which it is spread out and dried and then sown. The blue stone treatment is apt to impair the germination of the seed, but the formalin treatment is claimed to improve and invigorate it and at the same time is equally simple and more effective.

Formalin is sold commercially by chemists, and consists of a 40 per cent. solution of formaldehyde. The strength used for wheat is one pint of formalin to 50 gallons of water. The seed to be treated is spread out on a floor in heaps which are sprinkled with the solution by means of a watering can or garden syringe. After being wetted the heaps are well turned to ensure the fungicide coming in contact with all the grains and are then allowed to stand overnight, after which the grain may be dried and re-bagged or can be sown at once. It may here be noted that the treatment for barley is similar to that for wheat, but in the case of oats the strength should be one pint of formalin to 25 gallons of water, and the grain in the bags is best immersed for ten minutes in a receptacle containing the solution. A point to be remembered with this treatment or the blue stone treament of wheat is that for immersion the bags should be not more than two-thirds full to permit of easy permeation and allow for swelling of the grain.

Under the heading of pests must be included birds, buck, spring hares, cutworm and mice. At present, while only small acreages of wheat are grown on widely separated farms, birds are often a serious pest, but with larger acreages their attentions will not be so undivided, and the injury suffered by individual crops should be less. Birds should be tackled collectively, and their numbers can be controlled by shooting, by the destruction of their breeding places, and if necessary by the use of poisoned bait. The following particulars for the preparation of a poisoned bait for the destruction of small birds have been published by the Potchefstroom School of Agriculture:—

"Our experiences have shewn the following to be the best method for destroying grain-eating birds:—

"Obtain from the chemist one ounce of powdered strychnine alkaloid. Take two cupfuls of dry laundry starch or three large cupfuls of wheat flour, mix it with a little cold water, then add enough boiling water to make one half gallon (three bottles) of paste and cook for a few minutes until the paste is clear, stirring continually. Then stir in the strychnine powder. Pour this poison paste over 40 to 50 pounds of small grain, such as kaffir corn, mix thoroughly so that every kernel of the grain is coated with the paste. Then spread the grain out and let it dry. After being dried it can be kept indefinitely and used when desired. Fifty pounds is enough bait to last for a long time. Burn small patches of ground and scatter unpoisoned grain on these. After it is found that this grain has been eaten the poisoned grain can be used. The patches of ground should be some distance from the house, otherwise the poultry may be killed. Great care should be used in handling strychnine. It is very poisonous and dangerous, and a very small dose will kill a man."

As regards injury by buck, this again is most noticeable on small patches of wheat, which, being green when the surrounding veld is dry and brown, naturally attract the ground game of the neighbourhood. Some protection is afforded by two strand wire fences, but here too in most districts an increasing acreage under crop will militate against the concentration of the buck on any one area.

Cutworm are best controlled by the use of poisoned bait, *vide Agricultural Journal*, Vol. xv., Nos. 3 and 4, 1918.

Weeds.—The most important weed pest of winter cereals in Rhodesia is Darnel grass or Drabok (*Lolium temulentum*). This species of rye grass is a common impurity of all except the most carefully screened wheat, oat and barley seed. If not eradicated darnel grass quickly infests the land. It is an annual, and often matures and sheds much of its seed before the cereal crop is ripe. Thus part of its seed is left on the land to germinate again the following year, while the remainder is reaped and threshed with the crop and is very difficult to separate from the pure grain. The fact, however, that darnel is earlier in maturing than the cereal crop facilitates its eradication. When the weather becomes warm in spring the yellowish green and rather rigid shoots of the darnel can be easily distinguished among the wheat, oats or barley, and two or three weeks later the seed heads will appear. Prevention is better than cure, and wherever possible, only seed free from darnel grass should be sown. If, however, the land is already infested, the weed can be eradicated by hand pulling the plants immediately the seed heads appear and before the seed has an opportunity to shed.

Grazing Wheat.—The importance of preventing wheat coming into flower during the winter when frosts may be expected has already been referred to. It sometimes happens, however, that the crop comes forward more rapidly than was expected, and in such cases growth may be checked by grazing. Sheep are best for this purpose, but calves or even larger stock can also be used. Grazing will have much the same effect on the land as rolling, and after feeding off it will usually be well to run the light harrows over the crop. Grazing should not be too severe, and should be practised before the plants begin to pipe or shoot. The actual effect of feeding off on yield of grain is not definitely known, probably the effects are more beneficial than otherwise, but in any case if the crop is too far advanced for the season of the year, it is better to feed it off and check it than risk its being caught by frost.

The utilisation of vlei lands of all classes for the provision of winter grazing deserves much more serious attention than is at present afforded it. Wheat, oats, barley, rye or emmer can all be sown with this end in view, and a more frequent adoption of the practice would render the keeping of small flocks of sheep very much more profitable. To the dairy farmer or breeder of pure-bred stock also such grazing will be of the utmost value. For this purpose seed should be sown earlier—in February or March—and at a rather heavier rate per acre. Good winter pasturages of this description have been found capable of carrying as many as fourteen sheep per acre, and one of their chief uses is for the raising of early spring lambs.

Conclusions.—The statistical returns cited in the earlier part of this article shew that there is a local market for between 40,000 and 45,000 bags of wheat per annum, and that of this amount only some 10,000 to 12,000 bags are locally grown. The deficit must at present be made good by importations of wheat or flour from the Union of South Africa or from Australia. At a yield of five bags per acre a further 6,000 acres under wheat would yield this amount, and there is no reason why at the existing rate of consumption Southern Rhodesia should not grow sufficient wheat to meet all local requirements. There are comparatively few farms in the better watered sand veld districts where the occupier, by carefully choosing and working the soil, cannot grow enough wheat for his own needs.

In addition to the market for wheat, the South African Breweries require large amounts of barley for malting purposes, and soils which will grow wheat will also usually yield good or even better crops of barley. Oats, rye and emmer are of the greatest importance to the dairy farmer and pedigree stock breeder, on account of the green fodder they will provide in mid-winter. With irrigation the success of all winter cereal crops is assured. Without it, the acreage of moisture-retaining soil, on farms where such is found, will be dependent to some extent upon the rainfall, but by experience and scientific handling much may be done to stabilise this even in our dryest cycles, and even if not capable of producing a good yield of grain these same soils are still of infinite value for sowing to winter cereals for green soiling and grazing.

Turkish Tobacco.

By H. W. TAYLOR, B.Agr., Tobacco and Cotton Expert.

In the *Rhodesia Agricultural Journal* for October, 1918, a word of warning was issued in regard to the culture of Turkish tobacco. A number of growers are planting this type of tobacco with varying degrees of success. Turkish tobacco is comparatively easy to grow, but harvesting, curing, handling after curing, grading and baling require much labour and considerable skill, which can only be acquired by actual experience. The novice who has not seen Turkish tobacco properly handled, or, better still, done the work under competent supervision, will be very likely to fail at first, and so lose the fruits of his toil and outlay, which with this crop amounts to a considerable sum per acre.

In the past there has been much disappointment in regard to Turkish tobacco in this Territory, and the excellent returns secured by a few growers are mainly the reward for knowledge gained through practical experience.

The culture of Turkish tobacco is a highly specialised branch of farming which requires constant care and minute attention to detail. The object of this article is to point out the essential principles underlying the production of this type of tobacco.

This type of tobacco derives its common name from the country which is noted for its production. Turkish tobacco is grown principally in Turkey, Greece, Bulgaria, Russia and parts of Hungary. In these countries labour is cheap and efficient, the soil and climatic conditions are especially suited to its culture, and the growers are experienced and skilful. With these conditions, leaf of the finest quality is produced, and the tobacco is so handled that the proper flavour and aroma are obtained.

Where suitable labour and market conditions prevail, soil and climatic conditions are the deciding factors in Turkish tobacco production.

Climate.—As Turkish tobacco is sun-cured, it is essential that there should be practically no rainfall during the curing period. If Turkish tobacco becomes saturated with moisture through rain or heavy dews after being placed on the curing racks, the leaf is so reduced in quality that it becomes practically worthless. For Turkish tobacco the rains should cease about one month after transplanting. Should heavy rains prevail when the tobacco is approaching maturity, the gum is washed off the leaf, and the cured product is thin, papery and lacking in body, flavour and aroma. To produce Turkish tobacco of the best quality, the rainfall should occur during transplanting time and during the early period of growth. During the time when the tobacco is ripening and being harvested and cured the weather should be bright and warm, with no rainfall and only light dews.

Should frost occur whilst the tobacco is standing in the field, the leaf is killed and rendered useless. It is important, therefore, that the period between the last rainfall and the first frost should be sufficient to allow the plants to mature and the leaf to be harvested. This period should be of at least two months' duration, and longer if possible.

Generally speaking, the climatic conditions in Matabeleland are more suitable for Turkish tobacco than in Mashonaland, though no hard and fast line of demarcation can be laid down. In many parts of Mashonaland the rainfall is too heavy, the atmosphere during harvesting and curing is too cold, and frost often occurs before the whole crop can be harvested.

Soil.—In Rhodesia the best results are obtained from red clay loams, derived from diorite or schist formations. Fertile sandy loams, derived from granite, are also used, and produce Turkish leaf of excellent colour, with good combustibility, but somewhat lacking in body. Red sandy loams found on the contact between granite and diorite produce excellent Turkish tobacco.

Seed Beds.—The preparation and care of seed beds for Turkish tobacco are the same as for other types of tobacco. The area of seed bed required per acre depends on the distance at which the plants are spaced. In the Western Province 50 square yards of seed bed per acre will be found sufficient, but in Rhodesia, where the spacing is closer, growers usually sow 100 square yards of seed bed to provide plants for one acre.

Preparation of the Soil.—For the best results, the soil for Turkish tobacco must be thoroughly and carefully prepared. Turkish tobacco makes rapid growth, and therefore requires a readily available food supply. Thorough preparation of the soil greatly facilitates growth, and also saves a large amount of inter-tillage after the crop is transplanted. The depth of ploughing depends on the character of the soil. In ploughing, care should be taken to avoid bringing the sub-soil to the surface, as a small admixture of sub-soil with the surface soil has a detrimental effect on both the yield and quality of the cured product. All land intended for Turkish tobacco should be properly ploughed twice, and better results are obtained if the soil is given a third ploughing. After ploughing, the soil must be brought into fine tilth by the use of the roller, followed by a tooth harrow.

Location.—Low-lying soil should be avoided, as land so situated is usually too wet for Turkish tobacco, and in such locations the crop is more liable to damage from "white rust" (*Odium tabaci*). The soil selected should be on a gentle slope, the crest of a ridge, or at the base of a large hill or mountain. Land so located is generally well drained, and usually free from frost until very late in the season. If trees, tall grass or rank growing crops, such as maize, are not too close to the fields, free access of air tends to decrease the loss from "white rust."

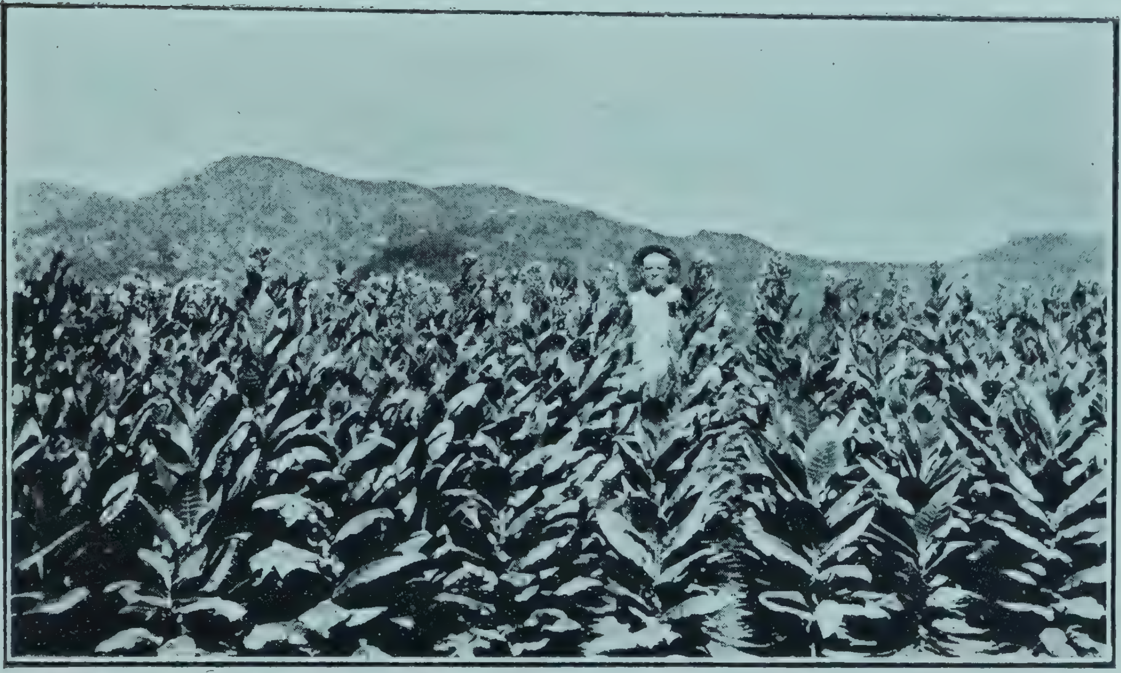

Fig. 1. Field of Turkish Tobacco, Mazoe Citrus Estate. Plants flowering; lower leaves ready for harvesting.

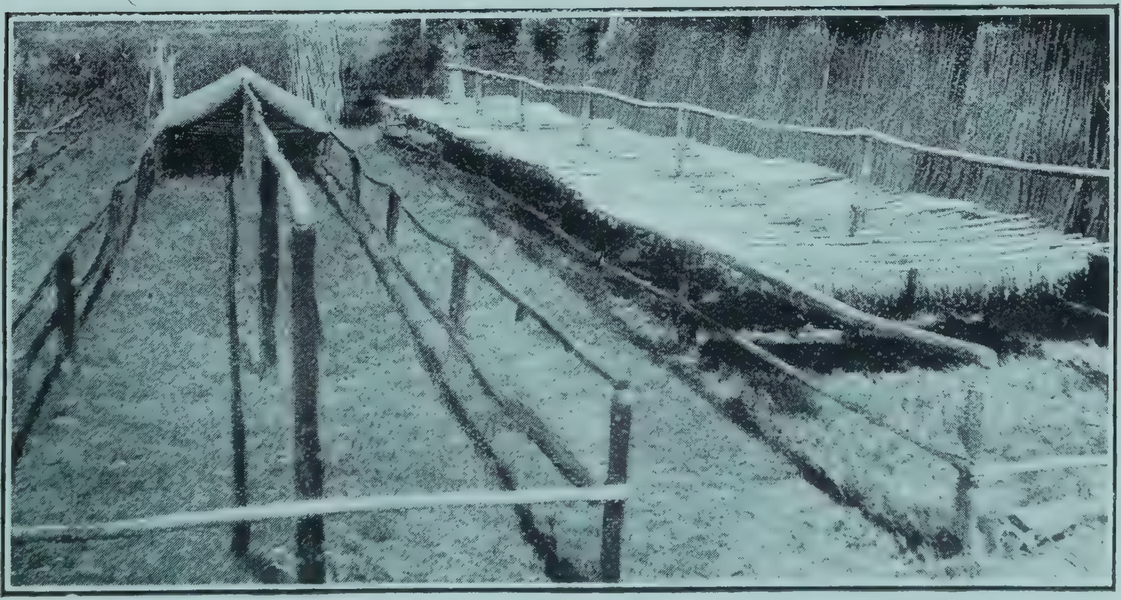

Fig. 2. Racks for curing Turkish tobacco. [Photo by P. Koch.

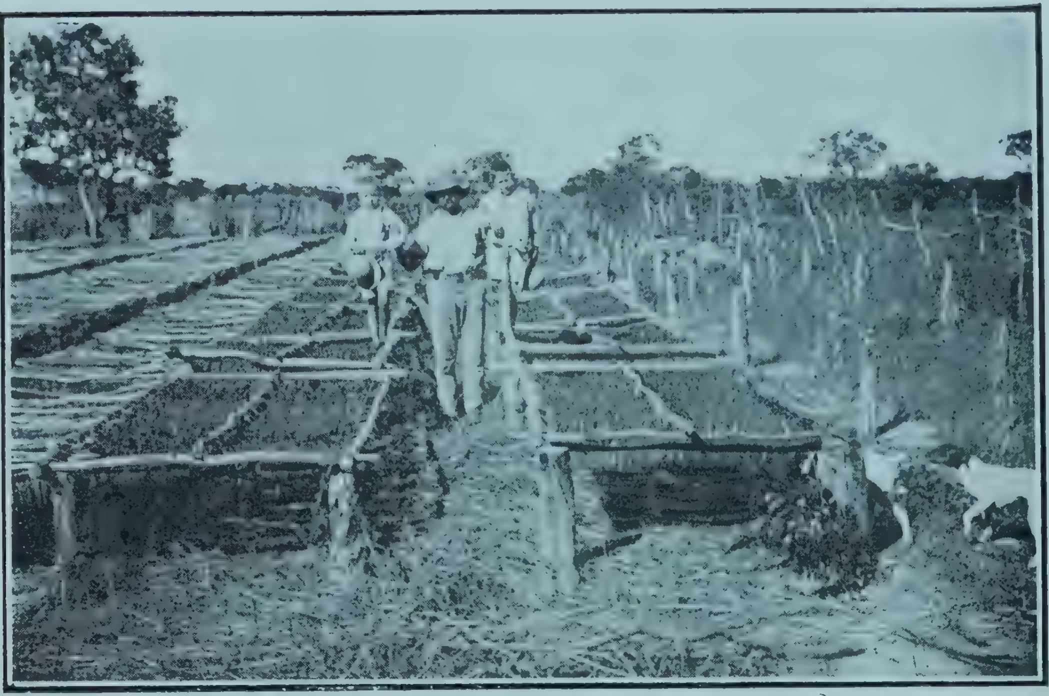

Fig. 3. Frames for curing Turkish tobacco. Frames in position on curing racks.

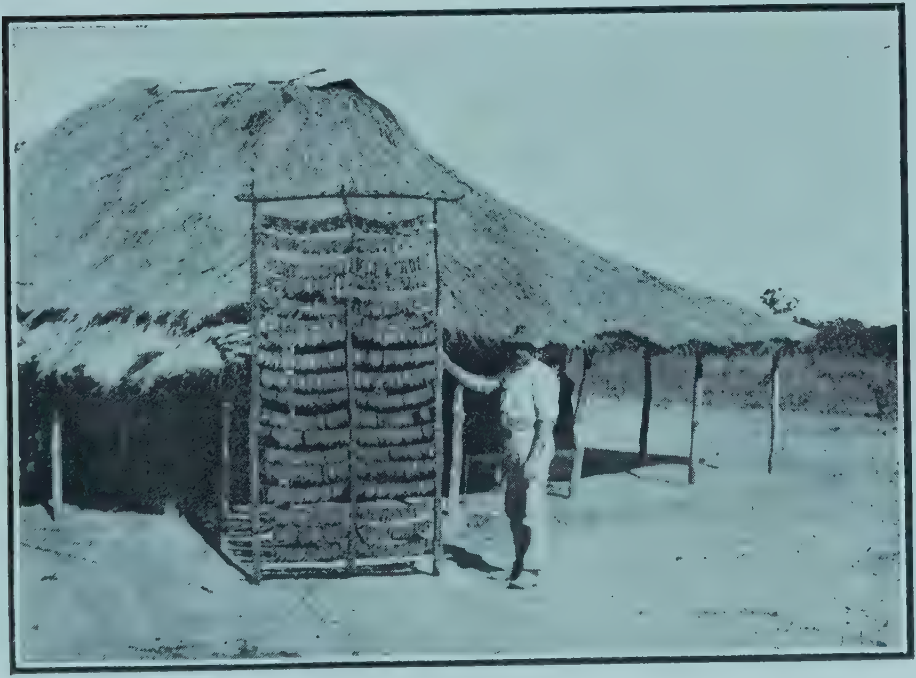

Fig. 4. Frame in position in which they are suspended in sheds for protecting tobacco from rain.

Fertilisers and Manures.—In Rhodesia no manures or fertilisers are applied to the red clay loams, as their natural fertility is sufficient to produce good crops of Turkish tobacco. When grown on sandy loams, of granitic origin, kraal manure, at the rate of eight tons per acre applied broadcast, is used, or a commercial fertiliser (8—20—10 formula) is applied at the rate of 200 lbs. per acre. If fertilisers of lower grade are used, the amount is proportionately increased.

Manure should be applied some time before the crop is transplanted, in order that the plant food may be immediately available for the young plants. After broadcasting, the manure is ploughed under, and with the second ploughing it becomes thoroughly mixed with the soil. Decomposition takes place readily if sufficient moisture is present in the soil. Manure is not recommended for use in drills, as the crop may suffer in dry weather.

Transplanting.—The actual operation of transplanting is practically the same as for other types of tobacco. As Turkish tobacco should not make rank growth, the plants are placed more closely in the field. The distance of planting varies with the locality, type of soil and soil treatment. Under Rhodesian conditions, the rows are 18 inches to 2 feet apart, and the plants are placed 8 to 9 inches apart in the rows. Ridging is seldom practised for Turkish tobacco, unless the soil is inclined to be wet. Shallow furrows are used for marking out the rows in the Western Province. The furrows indicate the rows and also assist somewhat in retaining moisture when they coincide with the contour of the slope. In Rhodesia, level planting is generally practised, and a wire chain is used for marking out the rows, the links indicating the spacing of the plants in the rows.

Under Rhodesian conditions, Turkish tobacco is transplanted from the middle of January to the end of February, in order that the rains may have finished before harvesting is commenced. The fields should be gone over as soon as the transplants begin to shew growth, and all blanks filled in with strong vigorous seedlings. Care in this connection will facilitate harvesting and curing, as all plants should ripen at approximately the same time.

Varieties to Grow.—Turkish growers in Rhodesia confine their plantings almost entirely to Kavalla, but in the Western Province Soulook, Samsun, Dubek and Yaca are grown in addition to the first named variety. Each variety has its own peculiar characteristics as regards flavour, aroma and burning qualities. It is desirable, therefore, from the manufacturing point of view that more than one variety should be produced in a locality, in order that the operation of blending the tobacco for cigarette purposes may be carried out with the best results.

Cultivation.—The first cultivation should be carried out as soon as the transplants have become established. Hand hoes and Planet, Jr. hand cultivators are used until the young plants are about one foot in height. Hand cultivation is generally practised on account of the rows being too close for cultural implements drawn by animals. No definite rule can be laid down as to the number of times the crop should be cultivated. The soil between the rows and between the plants in the rows must be kept free from weeds and grass, and a light surface mulch should be maintained. Just before the plants begin to flower cultivation should be discontinued, as stirring the soil after this period delays maturity to some extent. Moreover, the surface soil is usually dry at this time, and cultural operations cause dust, which adheres to the surface of the leaf, and which may be detrimental to the quality of the cured product.

Topping and Suckering. Turkish tobacco is not topped, consequently it is not usually necessary to sucker the plants (Fig. 1). Should suckers appear after heavy rains, occurring at the time the plants are nearing maturity, they should be removed, in order that the leaves may develop proper body before being harvested.

Priming.—The small leaves at the base of the plant should be removed before the flower head appears. These leaves are thin, papery, lacking in body and of little value. They should be discarded, as they are generally not worth threading, curing and baling. In damp weather the removal of these leaves assists somewhat in checking white rust, as the lower leaves are the first to be attacked.

Harvesting.—Turkish tobacco is harvested by the single leaf method, and the leaves are picked as they ripen. Great care must be taken to harvest the leaves in the proper stage of ripeness, as uniformity in the cured product largely depends on this operation. If the tobacco is harvested too green, the cured leaf will usually retain a greenish colour, which is undesirable. On the other hand, if the tobacco is over-ripe, the cured leaf lacks in body, becomes brittle and does not have a clear lively colour. When the leaf is ready for harvesting it has a limp touch, becomes somewhat transparent, and the clear green colour is replaced by a yellowish tinge. If the crop is grown on strong soil, or if the land has been too heavily manured, ripeness is indicated by flecks of yellow on the leaf and by brittleness of the veins and midrib. The first leaves to be harvested are naturally the bottom ones, and these are usually ready for picking at about the time the first flowers open (Fig. 1).

The best time for harvesting is early in the morning. At this time the true colour of the leaf is more easily determined, and as the leaves are not wilted, they break from the stem easily and without injury. Harvesting should not be done immediately after heavy rains, as the leaf will be thin and papery through the gum and oil being washed out.

In harvesting, the stem of the plant is steadied by the left hand and the leaves are removed by the right; with the thumb above and two fingers below, the leaves are removed by downward pressure. Usually not more than four leaves are picked at one time, so that several pickings are necessary to harvest the crop. As the leaves are gathered they are carefully placed in boxes or baskets (see frontispiece), all facing the same way, and are then conveyed to the stringing shed. All leaves harvested must be threaded and conveyed to the wilting room the same day. Tobacco left over for threading the following day may ferment and become worthless through discoloration.

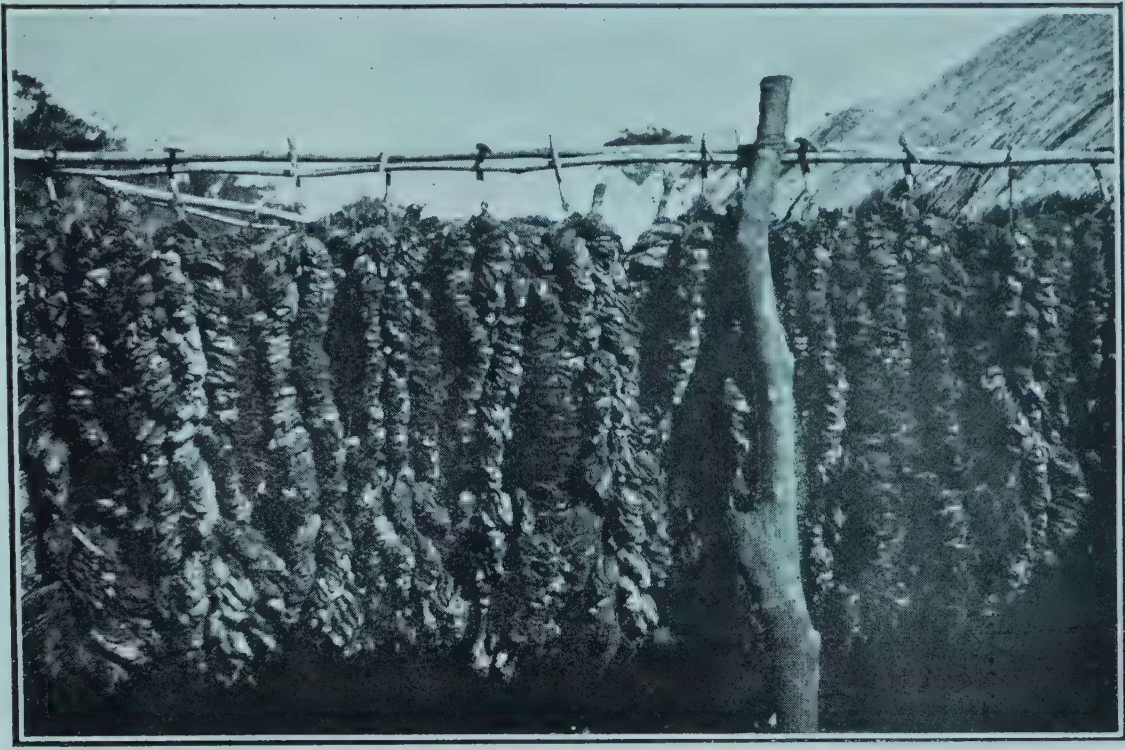

Fig. 5. Wreaths of Turkish tobacco.

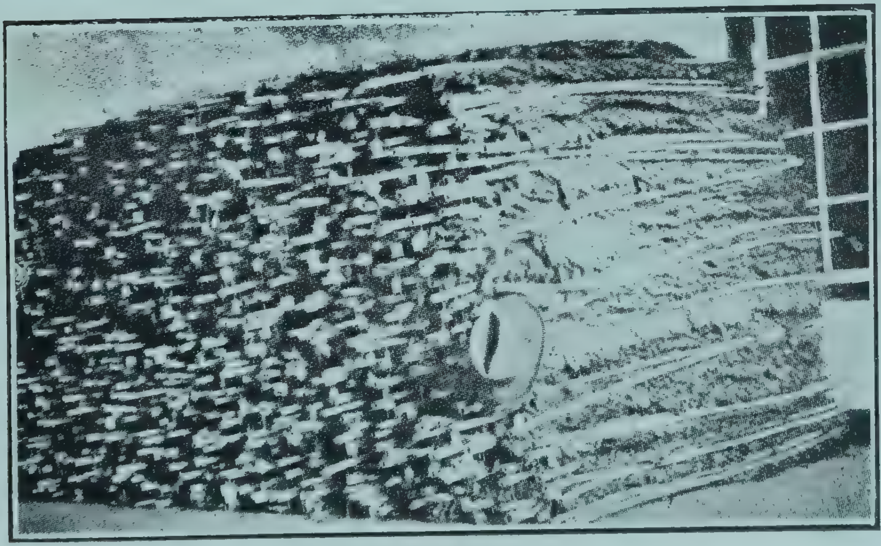

Fig. 6. Turkish tobacco bulked on the sticks. [Photo by P. Koch.

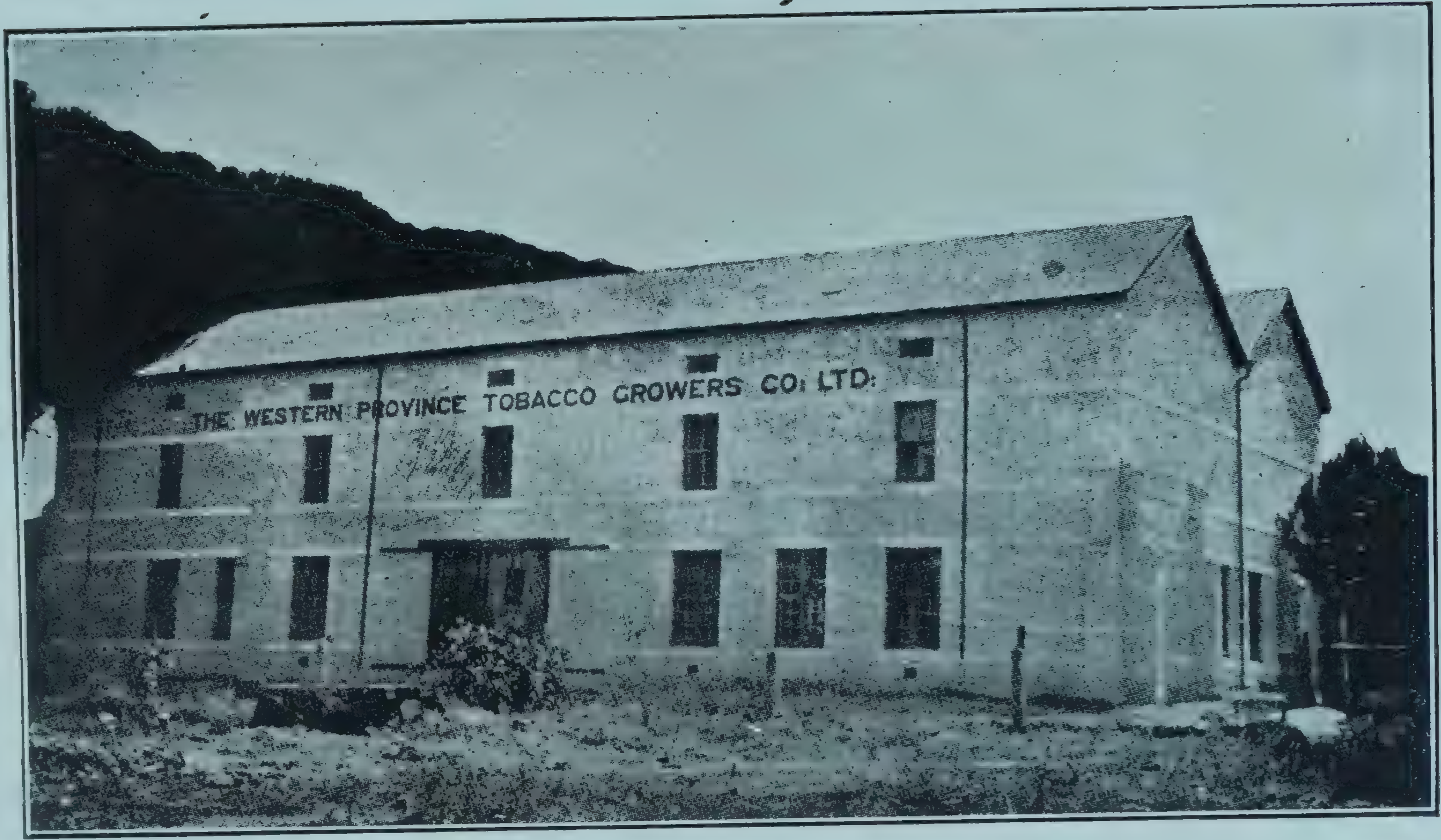

Fig. 7. Turkish tobacco warehouse at Paarl.
(From Bulletin No. 9, 1917, Department of Agriculture, Union of South Africa.)

Stringing.—The boxes or baskets of leaves are conveyed to a cool shed, where the leaves are threaded on to strings which are attached to laths or sticks. Before stringing, the leaves must be graded according to size and colour, and leaves of only one size and colour should be placed on each string. If this operation is carefully carried out, much time and labour will be saved at a later stage, and a more uniform cure will be obtained, which enhances the value of the tobacco. All leaves which are affected with white rust should be discarded, as they have practically no value. Leaves which are bruised or otherwise damaged should be threaded, cured and baled separately.

The graded leaves are threaded one by one on to a tobacco needle specially made for this purpose. These needles are about 15 inches in length, and, in cross section, are diamond shape. The needle is passed through the midrib of the leaf about one-half inch from the base. All leaves must face the same way, and are pressed close together on the needle. When the needle is filled with leaves, they are threaded on to a strong, thin cotton string. This operation is repeated until the string is filled with leaves. In threading the leaves, care should be taken to keep the butts of the leaves even, as this facilitates baling and gives the packed tobacco a neater appearance. When the thread is closely packed with leaves, it is placed on the floor, and a lath or stick is laid against the butts of the leaves. The ends of the string are attached to the corresponding ends of the lath, and supporting bands are tied around the string and lath at regular intervals to prevent sagging. Bamboos, Spanish reeds, wattles or other light, thin sticks can be used as laths.

Wilting.—As the laths are filled with tobacco they are placed in the wilting room. The building used for this purpose should be cool, free from draughts and dust, and fairly dark. In the Western Province these buildings are generally made of brick, but in Rhodesia pisé buildings or pole and dagga buildings are commonly used. Either type should have a thatched roof, in order that the temperature of the interior may be kept uniform. If the crop has been properly grown and harvested at the correct time, the manipulation of the tobacco in the wilting room will largely determine its final value. In order to obtain the best results, the temperature and humidity of the wilting room must be under complete control. If the temperature is too low the desired changes will not take place, and if too high, the leaf will wither quickly and fail to take on the proper colour. It has been found from practical experience that a temperature of 70° F. is conducive to the best results. Should the atmosphere of the wilting room be saturated with moisture, the leaf becomes damp and clammy from condensation, and there is danger of the tobacco becoming damaged from mildew. If the atmosphere is too dry, the leaves wither prematurely, and the green colour will remain in the cured product. With a relative humidity of about 85 per cent. the leaves undergo the proper changes in the wilting room.(1) This can be determined by the use of the hygrometer. When the wet bulb of this instrument registers 2½ to 3 degrees below the dry bulb, the relative humidity is approximately 85 per cent. If the difference be greater, moisture must be supplied, but should the reading be less, then the moisture must be reduced by providing ventilation. Both the temperature and humidity of the atmosphere can be controlled in a properly constructed building.

The interior of the wilting room is provided with racks for supporting the laths of tobacco. The laths should be spaced so that the leaves do not touch. If the laths are crowded together, fermentation may take place, which discolours the leaf and reduces the value of the tobacco. The length of time necessary for wilting varies with the stage of ripeness of the leaf when harvested. Green leaf requires a comparatively long time, while over-ripe leaf takes on the proper colour very quickly. Leaf harvested at the proper stage should only remain in the wilting room from two to three days. Over-ripe leaf will only require one or two days, and in some cases is best placed on the curing racks immediately after stringing, but it must be protected from the direct rays of the sun for a couple of days. Tobacco harvested on the green side should not be kept in the wilting room more than four days, and should be placed on the curing racks and covered with hessian for a couple of days to complete the yellowing stage.

Turkish tobacco should normally remain in the wilting room until the leaf takes on a pale greenish yellow colour. If kept in the wilting room until the yellow colour is fully developed, moisture accumulates on the surface of the closely packed leaves, which causes discoloration, and also injures the texture of the tobacco. If removed too soon, there is danger of the leaf being killed before the proper colour develops and the cured leaf retain its original green colour, which is very objectionable. Considerable skill and experience are required to properly carry tobacco through this operation. Lack of proper supervision at this stage is annually the cause of considerable loss to Turkish tobacco growers, especially in Southern Rhodesia.

Curing.—From the wilting room the tobacco is conveyed to the curing racks in the sun. These racks are of the proper width to support the laths, and their construction is shewn in Fig. 2. The rail above the laths of tobacco acts as a ridge pole to support the canvas which is used to cover the tobacco at night or during light showers of rain. When the laths are first placed on the racks they are spaced as closely as possible without the leaves touching, and if the sun is excessively hot the tobacco is covered with hessian or cheese cloth to prevent the leaf from sun burning. The following day the laths are placed about 4 inches apart, and the third day they are placed about 6 inches apart, and remain so spaced until the leaf is dry. The laths are placed close together at first and gradually given more space, to expose slowly the leaf to the full rays of the sun, in order to prevent premature drying.

On the curing racks the leaf gradually changes from a pale yellow to a clear yellow, and as the tobacco gradually dries out the colour slowly changes to a yellowish brown or bronze, which is the colour most desired in Turkish tobacco. A clear yellow colour in cured Turkish tobacco usually indicates that the leaf is lacking in body, flavour and aroma, while a very dark colour is indicative that the leaf was harvested too green or has been exposed to excessive moisture during curing. The length of time required to complete curing depends on the quality of the leaf, weather conditions and final manipulation. Thin, papery tobacco will cure much more rapidly than leaf of heavy body. During bright, warm weather less time is required for curing than during cool, cloudy weather. In the Western Province the tobacco usaully remains on the racks for 12 to 15 days, and the laths are then placed on the ground, on clean canvas, to complete the cure. The laths are turned daily, early in the morning, until the whole leaf, including the midrib, is thoroughly dry. In Rhodesia this is not done, the tobacco remaining on the racks until thoroughly dry. The latter method requires about one month, while in the Cape, curing is usually completed in from 18 to 21 days.

During the time that the tobacco is on the curing racks it should have some form of protection from light showers and from dew at night. In the Cape light canvas or hessian is used for this purpose. These materials are used in Rhodesia to some extent, but removable grass coverings are also used. On account of the high price of canvas during recent years, some Rhodesian growers are using removable frames (Fig. 3) for curing instead of laths. The strings filled with tobacco are attached to these frames, which are placed in the sun during the day (Fig. 4) and transferred to grass sheds during the night. The frames are so constructed that they can be suspended from tier poles arranged in the shed, and a large number placed in a comparatively small space. These frames are made of bamboos or other strong light material, and are extremely useful during the early part of the curing season, when heavy showers of rain may occur.

Treatment after Curing.—There are two methods of treating cured Turkish tobacco before it is graded and baled. In the first instance the strings are cut from the laths and the ends are tied together to form a wreath. These wreaths (Fig. 5) are suspended below the ceilings of sheds until the whole crop is cured, when they are brought into condition for grading and baling. When treated in this manner the leaf is exposed to the changes of weather conditions, which alternately render the leaf moist and brittle according to the humidity of the atmosphere. These changes in the condition of the tobacco are supposed to have a beneficial effect on the leaf, particularly in respect to colour. This method of handling Turkish tobacco is not practised to any great extent in South Africa.

The second method of treating cured Turkish tobacco is to place the leaf in bulks or stacks of convenient size. The thoroughly cured tobacco is removed from the racks early in the morning while the leaf is pliable and bulked on the laths, as shewn in Fig. 6. In bulking, great care must be used to obtain the best results. If the leaf is too dry, it will become damaged by breaking, and if too moist, there is danger of the tobacco becoming ruined through mildew. A good practical test for the proper amount of moisture for bulking and baling Turkish tobacco is to take a handful of leaves and press them together for a few seconds. If they expand on relieving the pressure, the tobacco contains the correct amount of moisture, but if they remain stuck tightly together, the moisture content is too high. The bulks should be examined daily to ascertain the condition of the tobacco, and should the leaf become hot, the stacks should be opened, the leaf exposed to the air for a short time, and then re-bulked. Tobacco should be bulked on plank floors which have plenty of ventilation underneath or on platforms raised about one foot to allow a free circulation of air under the stacks. Usually the tobacco should be re-bulked once each fortnight, and if properly handled the leaf will improve in colour and develop the aroma and flavour which are characteristic of Turkish tobacco.

Grading. In the Western Province, Turkish tobacco is placed into four grades, known as bottoms, middle-seconds, middles and tops (2) Each of these grades is again sub-divided according to size and colour of the leaf. Rhodesian Turkish is divided into five grades, corresponding to each picking, from bottom upwards, and each of these is subdivided according to size and colour of the leaf.

Grading is not undertaken until harvesting and curing are finished The tobacco is then brought into condition and the strings of tobacco are roughly graded according to size and colour. The strings are then brought into the grading room, where all defective leaves are removed and placed in boxes or baskets. These leaves are collected and baled as loose leaf, which realises a lower price. The strings of graded leaf are bulked on small platforms until sufficient tobacco of the several grades is collected to begin baling.

The importance of properly grading Turkish tobacco cannot be overemphasised. If Turkish tobacco of good quality is correctly graded, it is in strong demand and at remunerative prices. For badly graded Turkish tobacco there is practically no demand, and even though the major portion may be excellent in quality, the price paid by the manufacturer must be based on the value of low grade leaf.

Baling.—When sufficient leaf of each grade is available, baling can be commenced. The strings of tobacco are cut to correspond to the length of the press box, which is usually 2 feet. The width of the bale is 16 inches, and the height sufficient to secure a package weighing at least 80 lbs. The strings of leaves are then packed, with the butts outward and the tips towards the centre, layer upon layer until the press box is full. The lid, or follow block, is then placed on the tobacco and pressure applied by means of a screw until the proper density is obtained. The partially completed bale is allowed to remain under pressure for a short time, when the lid is released and the press box is refilled. This operation is repeated until the bale is of the required weight, when it should remain under pressure for about two hours before being removed Discretion must be used in applying pressure during baling. If pressed too tightly, the tobacco will become a compact mass which is difficult to separate, and if pressed too lightly the bales will dry out and also lose their shape.

When the bale is removed from the press, one end as well as the top and bottom is covered with hessian of good quality. The covering is held firmly in position by strong cord, which is laced over the sides and one end of the bale in criss-cross fashion, like a widely laced boot The bale is then weighed and labelled according to weight and quality and marked with the grower's name or number, when it is ready for despatch. Before shipment the open sides and end of the bale are covered with hessian to prevent breaking and also to assist in maintaining the proper moisture contents of the tobacco.

Treatment after Baling.—Turkish tobacco must undergo natural fermentation before the leaf is ready for manufacturing. Great care and attention are necessary during this treatment, which is best carried out in a properly equipped warehouse, under the supervision of a thoroughly competent and experienced man. In Rhodesia Turkish tobacco is usually sent direct to the manufacturer as soon as baling is completed, and the farmer is therefore relieved of any further responsibility. The Turkish growers of the Western Province have their own co-operative warehouse at Paarl (Fig. 7), where about 90 per cent. (1) of their total production is handled.

Each farmer sends his tobacco to the warehouse, where it is examined, classified and brought into proper condition to undergo fermentation. The bales are then placed in rows two deep and covered with heavy canvas to maintain the condition of the leaf. At regular intervals the bales are turned and examined. When fermentation begins, the bales are placed on the floor singly, where they can be easily examined each day. During the fermentation process the warehouse is so managed that the temperature and moisture conditions are kept constant, as sudden changes produce detrimental results. When the temperature of the baled tobacco begins to decrease the bales are placed on end, and when the temperature becomes normal the bales are again stacked. The tobacco should be turned and examined weekly thereafter for a couple of months, when it is ready for sale. As the fermentation of Turkish tobacco is not forced, the process depends largely on climatic conditions. Should the weather be uniformly warm, fermentation will be completed in about 21 to 28 days, but should cool weather occur at intervals, the process may continue for an additional fortnight.

If fermentation is properly carried out, the leaf will be much improved as to colour, flavour and aroma, and its value will consequently be greatly enhanced. Through careless handling, or failing to maintain proper conditions in the fermenting room, the leaf may be absolutely ruined. It is, therefore, of the utmost importance that this operation should only be undertaken by a skilful and experienced warehouse man, and then only in a properly equipped building.

It might be well to again warn growers that Turkish tobacco of poor quality has practically no value. Growers are, therefore, warned that unless their Turkish tobacco is of good quality they can only expect to grow at a loss. Thus it is important to restrict the acreage to suit the individual equipment and complement of labour for properly handling each crop.

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Fibre Crops.

DECCAN HEMP AND SUNN HEMP.
(HIBISCUS CANNABINUS) *(CROTOLARIA JUNCEA)*

By J. A. T. Walters, B.A., Agriculturist.

The establishment of a factory at Umtali which is prepared to deal with fibres grown in Rhodesia has brought the cultivation of fibre plants within the sphere of practical farming. The desirability of alternative crops in this Territory need not be emphasised, and it only remains to see whether these fibres produce a return that will prove sufficiently remunerative to induce farmers to adopt them as one of the general farm crops.

The two plants which up to the present have been mainly in request are *Hibiscus cannabinus* or Deccan hemp, and *Crotolaria juncea* or Sunn hemp. The former of these is indigenous to Southern Rhodesia, occurring as a weed practically throughout the Territory; the latter is a native of India. Both are in common use as sources of fibre in India, and are very extensively cultivated there, and most publications regarding them are based almost entirely on their behaviour in that country.

Whether these two crops can be rendered remunerative in Rhodesia depends upon a large number of factors. Some of these, such as their adaptability to our varying climatic conditions or soils, the amount of cane that can be grown per acre, the percentage of fibre contained in the cane, the quality of the fibre and roughly the cost of extracting it, can be determined by experiment. With a view to obtaining information on these points a number of trials have been conducted at the agricultural experiment station, Salisbury, both in growing the crops and in extracting the fibre, an account of which is given below. It may be remarked, however, that although the growing conditions were favourable and typical of what can be done generally in Rhodesia, the methods of extracting and preparing the fibre were necessarily crude, due to the lack of appliances and experience which would ensure the highest returns and the best quality of fibre. Consequently the returns given may almost be considered as the minima which the farmer can reasonably expect with the use of improved methods. Comparisons are drawn with the behaviour of the crops elsewhere in South Africa and in India, where the industry has been on a commercial footing for many decades.

Hibiscus Cannabinus, Deccan Hemp.—This plant is so well known that a botanical description would be superfluous. Owing to its prevalence as a weed, particularly in the ploughed lands of the sand veld

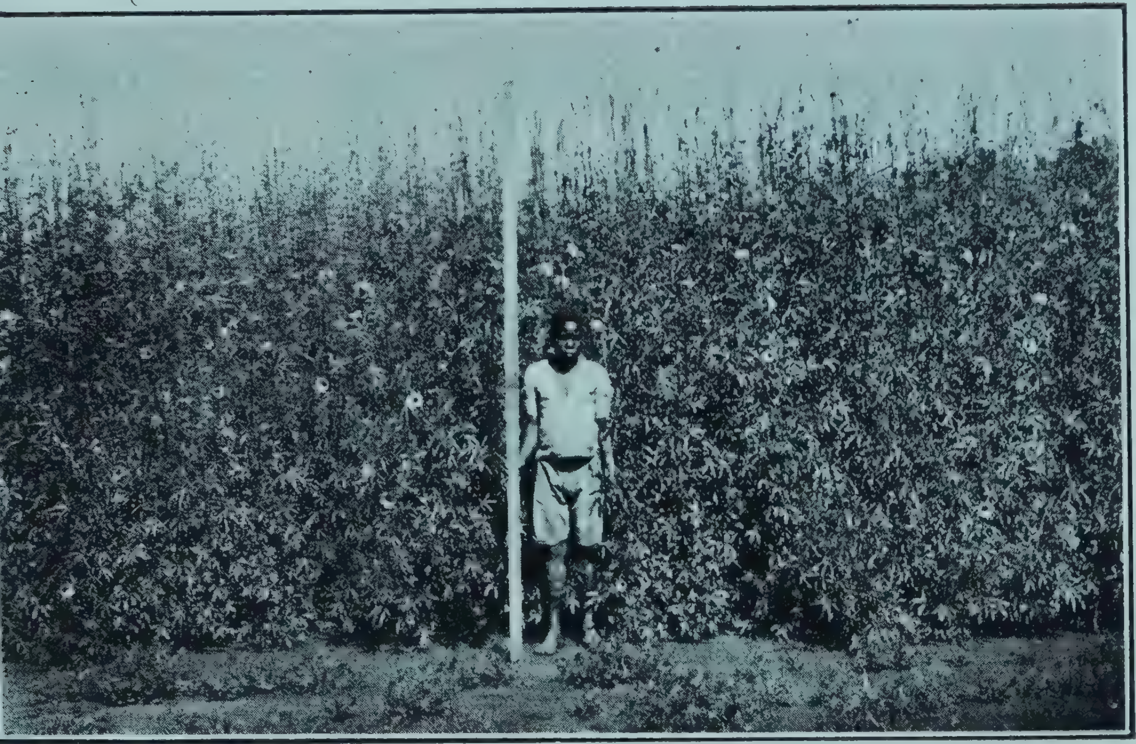


Fig. I. Hibiscus cannabinus, Agricultural Experiment Station, Salisbury, April, 1920.

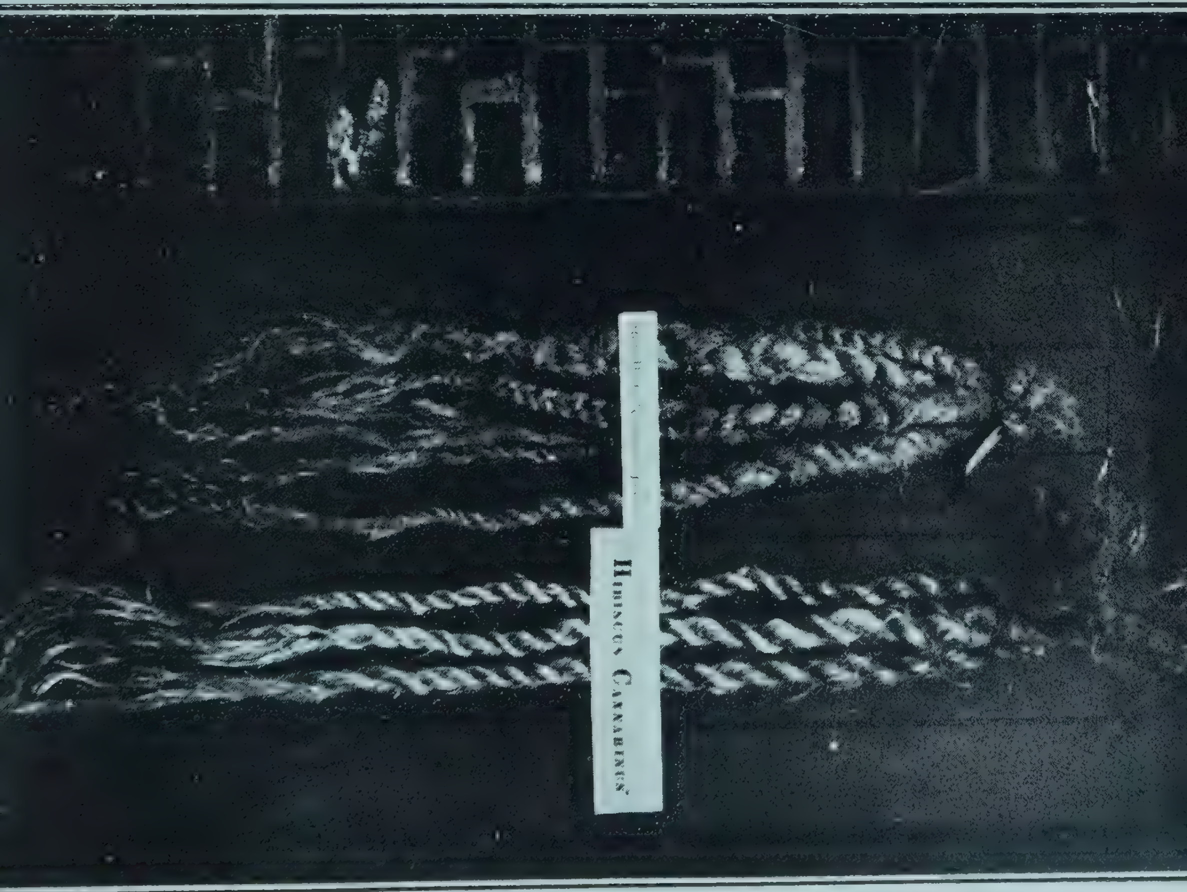


Fig. II. Hibiscus and Sunn hemp fibres prepared at the Agricultural Experiment Station, Salisbury, 1920.

it was expected to do well under cultivation, and the results obtained have justified this view, as may be judged from the photograph reproduced in Plate 1. Seed was sown on the 24th November, 1919, and the photograph shews the crop in April, 1920, when it was in full bloom and beginning to set seed in the lowest pods. The plants were then almost uniformly from 10 to 11 feet high. Seed had been sown in drills 9 inches apart at the rate of 30 lbs. per acre, which is the usual amount sown in India. In spite of excellent germination this sowing was found to be far too thin, as it resulted in undue branching of the plants, which is undesirable for the production of fibre. It is estimated that a very considerably heavier amount of seed could have been advantageously sown to prevent branching, and sowings in accordance with this indication will be made this season. The crop is usually harvested not earlier than the ripening of the first seed pods and while the upper portion is still in flower, but may be delayed until much later. The plants may either be cut close to the ground or be pulled up by the roots. In the present case the canes were harvested on the 1st June, and the figures given below shew that pulling gave a slightly increased yield in weight of cane. In order to determine the total yield of cane per acre, two plots, 1-16 acre each, were carefully measured, one being cut and the other pulled. The yield of green cane obtained was as follows:—

1-16 acre cut gave 1,290 lbs. = 20,640 lbs. per acre.
1-16 acre pulled gave 1,330 lbs. = 21,280 lbs. per acre.

These yields correspond very closely with those obtained at the Government Botanical Laboratory grounds at Pretoria. It remains to be seen whether the closer sowing advocated will improve this yield of over ten tons of cane per acre. A further test followed to ascertain the possible loss in weight due to drying out—an important point affecting the cost of transportation should a trade in cane ever arise and also in determining the percentage of fibre to cane. This gave the following result:—

Cut 1st June, 1920	430 lbs.
Weighed 10th June	274 lbs.

which represents a loss of 36 per cent. in total weight in nine days. The stalks then appeared perfectly air-dry. This dried material was then retted in a tank, sufficient water being maintained to counterbalance evaporation. After 20 days' retting the fibre was removed and dried. The yield of fibre obtained was as follows:—

274 lbs. dried cane produced 27 lbs. fibre.

This works out at 10 per cent. on the dried cane, or 6.3 per cent. on the original green cane. Taking the total production of cane per acre, the yields in the different stages at the same rate would be as follows:—

1 acre produces 20,640 lbs. green cane
= 12,960 lbs. dried cane
= 1,296 lbs. fibre

The fibre varied in length very greatly, due no doubt to the excessive branching referred to above, the staple ranging from 1 to 6 feet in length and averaging from 4 to 5 feet in the better samples after grading. Plate 2 will give an idea of the appearance of the finished product. It is in this condition that the fibre is baled for export and sale. The method of preparing the fibre (retting) was as follows:—The stalks were first bundled and allowed to dry out, during which time the greater part of the leaves was shed. They were then steeped in stagnant water until the fibre stripped off readily. This took about three weeks. The fibre was cleaned by whipping on the surface of the water, the water and soft gummy portions being subsequently pressed out between the fingers. The fibre was then allowed to dry, and when dry was roughly combed out. The stalks are sometimes placed upright in the water for a few days before being completely immersed, as the thick butt ends frequently take longer to soften.

A report on this crop in the *Journal* of the Union Department of Agriculture for September, 1920, states that "the yield of fibre has been from 10.7 to 11.9 per cent., and fibre of excellent quality has been obtained." The yield of fibre in India is stated to be from one to two tons per acre. Both these returns are higher than seem to be indicated from this preliminary experiment. The same journal contains reports on South African specimens of the fibre sent to the Imperial Institute for report and valuation in 1917, in which it is stated that the material on the whole was not well prepared and was valued then at £45 to £50 per ton, with a pre-war value of £15 to £18 per ton. A sample of this fibre prepared by Mr. R. G. Garvin, of Mazoe, and forwarded by this Department to the Institute in 1916 elicited the following comment:—"The fibre had not been well cleaned and prepared. The retting appears to have been effected somewhat unevenly." Nevertheless this sample was then valued at £27 per ton (May, 1916). It would therefore seem that the preparation of the fibre in South Africa leaves much to be desired, and has a lowering effect upon its commercial value. There is probably, however, no reason why this art should not be acquired with the same success as the more difficult one of tobacco curing.

The experiments referred to above were conducted at Salisbury on the prevailing red soils of this country. No data are as yet available as to its productivity on the sand veld, although from its behaviour as a weed there is no reason to suppose that it will not do at least equally well.

Of the effect of a crop of *Hibiscus cannabinus* on a succeeding crop little or nothing definite is known. Experiments are now being devised to test its effect on maize as compared with other well known leguminous crops. This is a point of special interest, and the result will naturally affect its adoption or otherwise as a staple crop in Rhodesia.

Records were taken in order to ascertain the amount of seed produced per acre. Owing to the fact that the seed pods ripen unevenly and that maturity on the same plant is spread over a number of weeks, it was found impossible to harvest the whole of the seeds. It was frequently observed that the earlier pods had completely shed their seeds before the later ones were ripe, and no satisfactory means of securing the greater portion of the seeds was devised. A yield of 55 lbs. of seed was obtained from one-eighth acre, or 440 lbs. per acre, but this is far from representing the total amount produced or which it may be possible to secure by improved methods of harvesting.

The cost of production of Hibiscus fibre given by the Rhodesia Fibre Co. of Umtali, and based on their experience in Northern and Southern Rhodesia, is as follows:—"An acre of cane is estimated to yield one ton of fibre. Ploughing and sowing will cost £1 per acre; preparation and transport of fibre £4 12s. 6d.—a total of £5 12s. 6d. per ton or per acre. The company is prepared to pay £10 per ton for fibre delivered f.o.r. at the nearest railway station. They are also prepared to buy seed at 6d. per lb." (This price for seed has been raised.)

Crotolaria Juncea, Sunn Hemp.—This leguminous plant has been grown on the agricultural experiment station, Salisbury, for a considerable number of years on account of its value as a green manuring crop. During this time three features have persistently marked this crop—its freedom from insect or fungoid pests, its heavy yield of seed and the large number of nitro-bacteria nodules formed on its roots. The genus Crotolaria is well represented in Rhodesia, no less than 25 species being recorded (in Mr. Eyles' collection of Rhodesian plants), but these do not include the species now under remark, which is probably indigenous to India. In India this plant has been used as a source of fibre from times immemorial and at the present day is exported in large quantities to the European markets. In methods of retting and general preparation of the fibre it resembles *Hibiscus cannabinus*, but Indian returns shew that, although Sunn hemp commands a higher price as a commercial product, the yield of fibre is distinctly lower than that from Hibiscus. According to the Agricultural Ledger of India the average amount of Sunn hemp fibre turned out is about 1,000 lbs. per acre. Other writers put the average as low as 640 lbs. This decrease in yield, as compared with Hibiscus, is, however, counter-balanced very largely by its value as a green manuring crop, a value that is fully recognised by the Indian cultivator. Remarks on this feature of the plant will be made later.

Experiments to determine the yield of commercial fibre under Rhodesian conditions were conducted as follows:—Seed was sown on the 24th November, 1919, in rows 9 inches apart, and the plants were spaced at an average of about 6 inches apart in the rows. Planting at this rate resulted in the stems being fairly free of branches for about two-thirds of their height. They branched freely above this and produced a heavy crop of seed. In this case again a thicker sowing will probably prove better, and broadcasting is likely to be more satisfactory than drilling. The plants grew to a height of from 5 to 8 feet, the variation in height being very marked in contrast with the uniformity of the neighbouring plot of *Hibiscus cannabinus*. The rate of sowing for fibre in India is said to be from 80 to 100 lbs. per acre, a rate which results in the production of straight branchless stems, and tests in this direction will be necessary to determine the most desirable rate for Rhodesia, and will be undertaken this (next) season. To ascertain the weight of green cane at maturity 1-16 of an acre of canes was cut near the ground and a similar area was pulled. The yields were as follows:—

1-16 acre cut gave 460 lbs. = 7,360 lbs. per acre.
1-16 acre pulled gave 482 lbs. = 7,712 lbs. per acre.

No figures for green weights in India are available for comparison. To find out the loss in weight through drying the canes were allowed to stand for ten days, when they were considered to be air-dry. The loss is in very marked contrast to the Hibiscus:—

Cut 1st June … … … … … … … …	160 lbs.
Weighed 10th June … … … … … … …	155 lbs.

which represents a loss in weight of 3 per cent. only. A further experiment was adopted with this crop, viz., a comparison of the yield of fibre from the cut and pulled canes respectively. The slight difference shewn may well be due to experimental error, but the percentage of fibre to cane shews a marked decrease to that in the case of the Hibiscus:—

400 lbs. canes cut gave 17¼ lbs. fibre.
400 lbs. canes pulled gave 13½ lbs. fibre.

an average of only 3.8 per cent. of fibre to cane. At the same rates, therefore, an acre of Sunn hemp might be expected to produce as follows:—

Yield of cane per acre = 7,360 lbs.
= 7,139 lbs. dried cane.
= 303 lbs. fibre.

It is not unreasonable, however, to expect that with heavier sowings a considerable increase in weight of cane and percentage of fibre may ensue. The weight of green cane was confirmed by a later sowing made on the 31st December and broadcasted at the rate of 20 lbs. seed per acre. The weights obtained were as follows:—

1-16 acre cut gave 420 lbs. = 6,720 lbs. per acre.
1-16 acre pulled gave 450 lbs. = 7,200 lbs. per acre.

As the crop requires a full season to come to maturity, this reduced yield as a result of late sowing was to be expected.

No recent report on the value of Sunn hemp fibre on the English market is available. Pre-war prices for the Indian product ranged from £17 per ton for poorly prepared material to £25 per ton for well cleaned fibre, the length of staple varying from 4 to 7 feet. Prices are probably very much in excess of this figure at the present time. The cost of production may be taken as the figure given above for Hibiscus fibre.

As mentioned above, this plant seeds extremely freely. As the object of the cultivation of this plant is not seed production, no definite trials have been made to ascertain the maximum amount of seed possible per acre from a crop of Sunn hemp. A trial made in 1915 at the agricultural experiment station with a thin sowing gave a return of 960 lbs. seed per acre. An ingenious method of threshing out seed is in use by Mr. C. A. Dimmock, of Virginia Farm, and is shewn on Plate 4.

It has already been mentioned above that Sunn hemp has an especial value as a green manuring crop. This is due to the fact that it roots deeply, produces nodules freely and bears a heavy growth of leaf and stem, which are available for ploughing under. The observations referred to above were made on its behaviour in the red soil near Salisbury. The adjoining report from Mr. Dimmock, of Virginia Farm, is extremely interesting as an account of its behaviour on the sand veld. The excellence of his report warrants its publication in full.

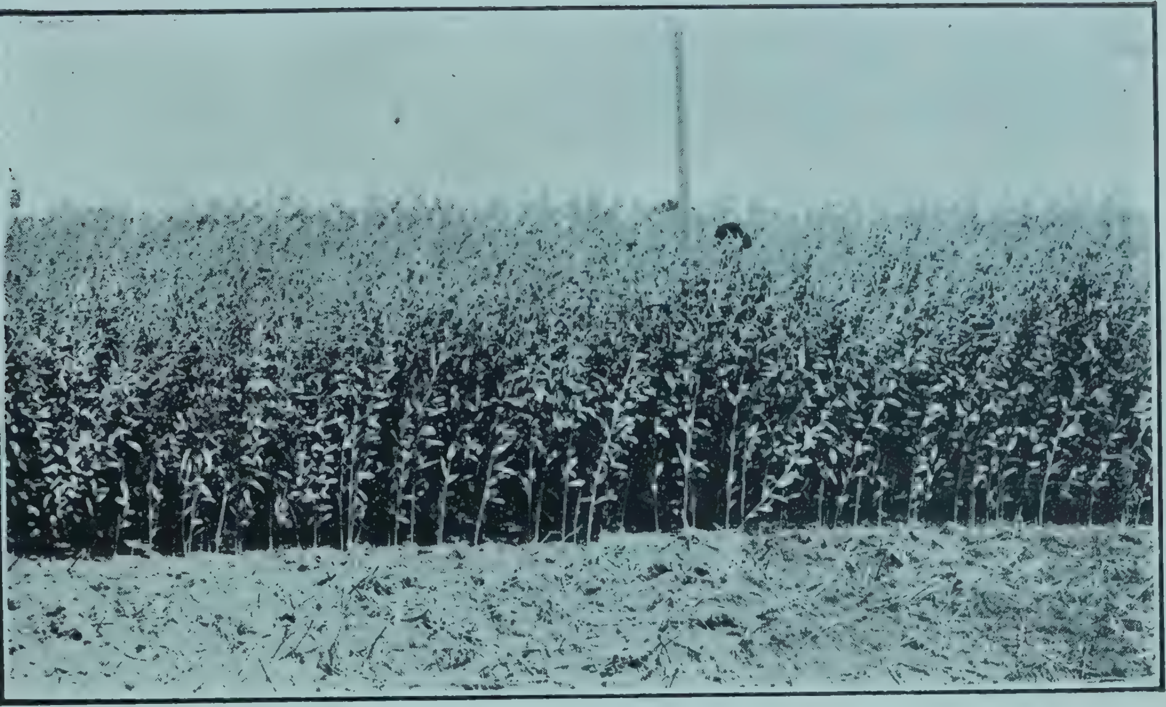
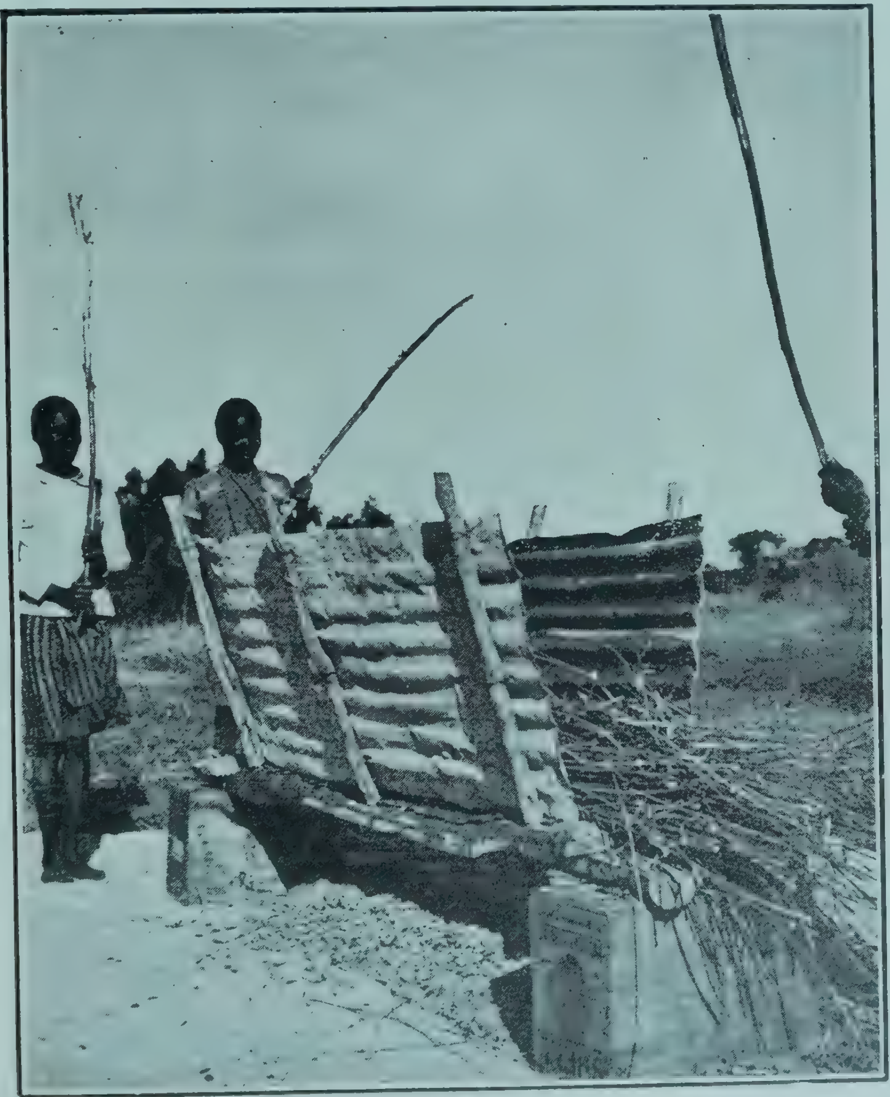


Fig. III. Sunn hemp (*Crotolaria juncea*), Agricultural Experiment Station, Salisbury, April, 1920.



"Soil.—Half acre ploughed, harrowed and weeded 10th December, 1919; sandy soil, poor; had tobacco on four years ago, since fallowed.

Seeding.—15 lbs. per half acre, sown 18th December; seeds germinated nine days after sowing; plants singled out to 1 foot apart.

Pests.—Grasshoppers ate tops of young plants in places, also a hairy caterpillar.

Growth.—At one month plants 9 inches high; on 29th February plants 5 feet high; flowering started on 21st February.

Spacing.—Condition of growth seems to point to best distance for drilling being not more than 9 inches apart and plants every 6 inches in the rows; this would enable plants to grow straight up and not throw out useless branches for fibre.

Suitability.—Soil seems to suit the plants excellently.

Roots.—Are covered with nitrogen nodules; have never seen so many on any other crop.

Subsequent Growth.—25th April, still flowering. Most of flowers are fruiting. Height of plants, 6 feet all over. Nitrogen nodules still in evidence on roots; 20th May, seed pods plentiful, but green and unripe; leaves dropping and stems drying; 20th June, about 25 per cent. of pods still unripe; cattle eating it as they do dhal; 30th June, cut about one-quarter of the plot, dried for two days and threshed; nitrogen nodules have disappeared; 17th July, cut last of plot; some beans still unripe; 240 lbs. of seed were harvested.

Effect of Crop.—I notice that it has thoroughly cleaned the land of weeds, and it ought to be valuable for this purpose as well as being a fibre and a nitrogen gatherer.

Feeding Value.—Cattle seem extremely fond of the dried leaves which cover the ground after removing the crop for seed; they stay contentedly on it for hours, greedily eating the leaves.

Root System.—Tap root seems to go down 18 to 24 inches; roots branching and strong; these roots must dig and aerate the soil well.

General.—Should say it would be easy to grow on a large scale; it needs practically no cultivation and kills out weeds."

The employment of Sunn hemp as a green manure is thus described by Watt in his Commercial Products of India: "The cultivators of India have all along recognised this plant as a useful aid in soil-improvement. It may for that purpose be grown on all kinds of soil, especially if infested with weeds. For this purpose it is usually uprooted when two to two-and-a-half months old and then ploughed in, especially when followed by potatoes." The Agricultural Ledger of India states: "The cultivation of Sunn is considered necessary to enhance the fertility of the soil before jute or rice is sown." Trials to estimate the effect of this crop on a succeeding crop of maize are being undertaken this season at the experiment station, Salisbury. With regard to its feeding value Mr. Dimmock's experience was confirmed at the experiment station, Salisbury, where both sheep and cattle greedily ate the dried leaves off the ground. The Agricultural Ledger states that in India cattle are often turned into the field to eat the green leaves and twigs of the plants. A note on the poisonous properties of Sunn hemp seed appears elsewhere in this *Journal*, and deserves attention.

Conclusions. 1. Both Deccan hemp and Sunn hemp seem to thrive on the common red and the granite soils of this country under conditions suitable for maize. Their behaviour on heavy black or moist soils has not been determined.

2. Both plants are sources of valuable commercial fibre. The yields obtained so far are lower than those quoted for India, but there is every reason to believe that these can be materially increased with experience in growing the crop and extracting the fibre.

3. Sowings of 30 lbs. per acre of seed were not sufficiently thick to prevent branching. Considerably heavier sowings seem indicated for the production of the best quality and heaviest weight of fibre.

4. Sunn hemp even when harvested for fibre has a beneficial effect upon the soil by the action of its roots and foliage and by its repressive action upon weeds.

5. Deccan hemp is probably less valuable in this respect, but the adaptability of these two crops to Rhodesian conditions makes them highly desirable as constituents in a system of rotation with maize or tobacco.

The Cattle Industry.

A meeting of the utmost importance to the cattle industry of Southern Rhodesia took place at Bulawayo on the 20th November, when the following resolution was, after an interesting discussion, unanimously adopted:—

"That it is of urgent importance that comprehensive accurate information regarding the present position and immediate prospects of the cattle industry of Southern Rhodesia be compiled and made available to all interested, with a view to furnishing data upon which may be based proposals for the development of a meat industry by means of export and manufacture.

"That this public meeting nominate the undermentioned committee, with power to add to its numbers, to carry into effect the above resolution, to take action to secure that purpose, including raising funds necessary for its expenses, and to make public its report at an early date.

"Convener: The Chairman, Cattle Owners' Association of Rhodesia. Committee: The following gentlemen in their individual capacity—

Messrs. Crewe, Morgan, Dechow, Huntley, Brebner, R. W. Fletcher, Asserman, Ewing, O'Keefe, H. P. Fynn, Estment, Haskins, W. White, V. Chennels, J. P. Richardson, Leo Robinson, W. H. Rogers, Bawden, McMurray, J. Stewart, H. S. Henderson, Geo. Mitchell, T. Meikle, Haddingham, Carruthers, Bookless, Coles, Hay, H. Cummings, Hibbert, Brockelhurst, Worthington, J. Austen, Haddon, Biddulph, Herud, L. K. Robinson, Struthers, Rademeyer, J. Williams, Dalton, Woodforde, Kenny, McCulloch, Fellowes, Browning, Partridge, J. A. Edmonds, Glanfield, Macarthur, E. Scott, Dobbin, C. J. Austen, Gresson, O. Rawson, Colborne, Peake, Chalmers, Fischer, Harnden, Lloyd, J. Meikle, English, Strickland, Longden, Martin, Bernard, Morkel, Futter, C. R. Edmonds, Bradshaw, Major-General Sir Reginald Ford and Sir Francis Newton.

"And representatives of Department of Agriculture, Veterinary Department, B.S.A. Company, Commercial Branch, Estates Department, Union Miniere, B. & M. & R. Railways, Small Workers' Association, Chamber of Mines, Chamber of Commerce, Municipalities and Village Management Boards, Legislative Council, Odzi Canning Factory, other Cold Storage Companies in Rhodesia, Co-operative Societies in Rhodesia, Standing Committee of the Agricultural Union, Executive Committee of the Cattle Owners, Northern Rhodesia Farmers' Association, and nominees of the following ranching companies:—B.S.A. Company, Liebig's, De Beers, Willoughby's, Mashonaland Agency, Anglo-French, Rhodesia, Ltd., Rhodesia Lands, Farm Lands of Rhodesia, B.E. Company and the Goldfields."

It is hoped that this very representative committee will, at an early date, issue its report, which will be awaited with the greatest interest by all connected with the cattle industry. Owing to data not being available it is not possible to deal with this matter as fully as we desired. We hope, however, to return to the subject in our next issue.

Selection of Virgin Land for Arable Farming.

By G. N. Blackshaw, O.B.E., B.Sc., F.I.C.,
Chief Chemist, Department of Agriculture.

In selecting virgin land for cultivation, the agriculturist has to take into account several important factors which must be carefully studied on the spot, and the writer has been prompted to draw attention to some of the more important of these considerations for the guidance of new settlers who have not had an opportunity of acquiring local experience.

In dealing with the numerous samples of soil submitted to the Agricultural Department, it is frequently found that the sender supplies no particulars whatever with regard to the section of soil represented by the sample, the depth of the soil and those other features which would enable the Departmental officials concerned to obtain a fair appreciation of the field conditions which exercise so great an influence upon the cropping capacity of the soil, and which are therefore of the highest importance.

Without full knowledge of the field conditions it is difficult, and in many cases impossible, to give reliable advice regarding the suitability of a soil for arable farming, the crops for which it is fitted and its cultural treatment. Failure to supply information concerning the conditions which obtain in the field is in many cases due to the common impression that advice as to cultural treatment can be deduced solely from the chemical composition of a soil as revealed by analysis, but such a claim cannot be accepted unreservedly.

The total quantity of plant food in a soil, its inherent fertility in other words, can be determined exactly by analysis, but to distinguish between the forms of plant food which are so easily dissolved in the soil water that they can, at once, be used by plants, and those forms which are so insoluble that plants are unable to derive nourishment from them, is a problem which has not been solved satisfactorily. Consequently to follow the example set in other countries, the necessary information regarding the most profitable manurial treatment for any type of land will be acquired by means of carefully conducted field trials in conjunction with soil analyses and not by soil analyses alone.

The foregoing remarks regarding the value of soil analysis refer in particular to soils which present no abnormal characteristics such as marked infertility. The analysis of a soil which is infertile for no apparent reason may be the means of suggesting a practical method by which the cause of the infertility can be wholly or partially removed, without it being necessary to conduct preliminary field trials.

Admittedly, much remains to be learnt concerning the soundest and most profitable management of Rhodesian soils, but from the information so far gained in the field and in the laboratory over a number of years, we are often able, without recourse having to be made to a detailed chemical analysis, to give advice of practical value not only with regard to the crops which are suitable for a soil, but also upon its cultural treatment.

Among the important field conditions by which one should be guided in the selection of virgin land for cultivation are included (1) the quality and density of the natural vegetation carried by the soil and the deduction to be drawn therefrom concerning its inherent fertility; (2) the depth of the soil; (3) the nature of the sub-soil; (4) the efficiency of the natural drainage of the soil; and (5) where such information is available, the crop returns which have been obtained in the neighbourhood on similar soil which carried similar native vegetation.

Guided by these considerations and taking into account the cost of any stumping that may be necessary, the farmer should select the best maize or tobacco land, as the case may be, available for cultivation, rather than some block of open land simply because it is open and promises to be inexpensive to work.

In all cases where there is the slightest reason to suspect that the soil possesses peculiar characteristics, it is advisable to submit a sample of the soil to the Agricultural Laboratory, Salisbury, with full particulars, so far as the same are available, as detailed below.

It has frequently come to the writer's notice that the selection of a particular portion of land for cultivation has been made, irrespective of its appearance, because no stumping was necessary and the land could be turned up without any preliminary clearing.

It is, however, a wise axiom, except in the case of vlei soils for winter cereals, never to put under the plough any land carrying poor wiry vegetation so long as better soil is available. Another settled principle when selecting land for cultivation is to ascertain the *depth* of the soil and the nature of the sub-soil; failure to do this is by no means uncommon, and it has led to disappointing crop returns in many cases in which the soil proved to be so shallow that a considerable proportion of raw sub-soil which required some time to mellow down was brought to the surface by ploughing to a depth of 6 or 7 inches, whilst in other cases the poor results were found to be due to the soil being underlain by a stiff cold sub-soil with consequent unsatisfactory under-drainage.

Obviously good soil of sufficient depth and of suitable texture for the crops in view is to be sought when selecting land for cultivation. To ascertain the depth of the soil and the nature of the sub-soil, a much more convenient tool than a spade is a post-hole auger, 3 inches diameter, which is a comparatively inexpensive tool and is a handy implement on the farm.

When it is desired to draw a sample of soil to be submitted to the Department of Agriculture for examination, the following directions for taking samples will serve to guide those concerned:—

Four or five spots should be selected in the area upon which a report is required. After removing surface accumulation of decaying leaves, etc., and pulling up the plants which may be growing upon a selected spot, dig a hole 18 inches deep and trim one side so as to be smooth and vertical. From the side so prepared remove with the aid of a sharp spade a vertical slice of uniform thickness—about 3 inches—of the soil to a depth not exceeding 9 inches (the depth of soil is indicated by a perceptible change in colour to sub-soil; if the soil is more than 9 inches deep, the slice should only be taken to a depth of 9 inches; if the soil is, say, only 7 inches deep, the slice should only be taken to a depth of 7 inches).

Place the slice in a clean receptacle and *mix thoroughly* with similar slices taken to a similar depth in the same way from the other spots selected in the area. About 6 lbs. of the mixture should then be placed in a clean bag or wooden box.

An average sample of the second 9 inches from the surface, or of the top 9 inch section of sub-soil if the soil is less than 9 inches deep, should be taken in the same manner at the spots selected.

NOTE.—*If the soil of the area presents notable differences, the samples gathered from the different parts should be kept separate.*

The samples should be carefully labelled and forwarded, carriage prepaid, to the Chief Chemist, Department of Agriculture, Salisbury, together with the following particulars, in the case of each sample, so far as the same are available:—

(1) Name of farm from which the sample was obtained.

(2) Section of soil represented by sample.

(3) Position from which sample was taken (from sloping, flat or vlei land).

(4) Depth of soil in the area, nature of the sub-soil, and efficiency of natural drainage.

(5) Geological formation and the quality of the natural vegetation in the area.

(6) Whether the sample was taken from virgin or cultivated land. If from cultivated land:—

  (a) number of years the soil has been under cultivation;
  (b) crops borne;
  (c) previous manurial treatment, if any;
  (d) previous agricultural returns.

(7) Crops for which advice is required as to cultural treatment.

Notes on the Water Law of Southern Rhodesia.

By R. McIlwaine, M.A., LL.B., Water Court Judge.

Increasing settlement and development of the land is leading to more interest in the use of water on farms. The following notes are not intended to be a complete exposition of the water laws of the country; they deal only with aspects of the subject which are of practical importance to persons using or desiring to use water for irrigation or other purposes.

On the occupation of the country the common law of South Africa introduced with the settlers governed water rights. This law had its origin in Holland, a humid country, and proved unsuited to South African conditions. The comparative absence in this country of vested rights in water acquired under the common law offered a clear field for the passing of legislation suited to local conditions. This legislation is contained in the "Water Ordinance, 1913," as amended by the "Water Ordinance, 1913, Amendment Ordinance, 1920." These Ordinances constitute a radical departure from the common law by vesting all water, other than private water, in the Administrator, and providing machinery for its allocation to individuals. The common law regarded such water somewhat in the light of property attaching to riparian land.

A person owning private water may use it freely without special permission; if, however, he desires to appropriate water from a public stream, for other than primary use, he must receive authority so to do. It is therefore desirable to understand the meaning of the terms "private water," "public stream" and "primary use."

"Private water" is all water, not being water of a public stream, which rises naturally on any land or which falls or naturally drains on to any land, so long as it remains on such land and does not join a public stream. Now a "public stream" is a natural stream of water (1) which in ordinary seasons flows in a known and defined channel (whether or not such channel is dry during any portion of the year), and (2) which is capable of being applied to the use of riparian proprietors.

The position may be made clearer by illustrations. For example, if a landowner has a swampy vlei or valley with water flowing through in reeds or other vegetation, but not confined to defined banks, it would be private water; so also would be water from rain falling on land, if intercepted by a dam before reaching a public stream. The moment, however, that such water breaks from the swamp and becomes a stream within defined banks and capable of being applied to riparian lands, that is of sufficient volume to be so applied, and the moment the rain water reaches a public stream, it passes out of the landowner's absolute control.

"Primary use" is the using of water for domestic requirements and the watering of stock necessary for ordinary farm purposes.

From this it follows that a landowner with a public stream flowing over or by his land can use it for domestic purposes or for stock on his land, without let or hindrance, but he could not, for example, sell or supply it to others for domestic use or for the use of stock not on his own land. While, therefore, a person may freely use private water, or water from a public stream for primary purposes, he may not use water from such stream for secondary or tertiary purposes without having received the necessary authority as provided for by the law. Secondary purposes is the irrigation of land or the watering of stock other than farm stock, and tertiary purposes is use of water for mechanical, industrial purposes or the generation of power.

As already indicated, the water of public streams is vested in the Administrator, that is to say, it is reserved by the Government of the country, not that it may be sold or otherwise dealt in, but in order that it may be controlled and allocated to individuals on conditions that will ensure its being put to useful and proper purposes.

When a farmer applies for the right to use water from a public stream one often hears another farmer on the same stream express the view that he has just as much right to a share of the water as the applicant. This view reflects the old common law doctrine which gave every riparian proprietor the right to a share of the water. This law often resulted in a stream of limited volume being claimed by so many that it was of no use to anybody. On the other hand the Rhodesian Ordinances, while giving due weight to the position of the riparian owner in so far as it enables him to make beneficial use of water, adopt the principle that the water belongs to the public and provide that it shall be allocated in a manner which will secure its most advantageous use. If, therefore, a farmer has land well suited for irrigation, and there is a stream which can be economically used for the purpose, the law permits of him acquiring the right to use even the whole of the water for irrigation, although it may leave no water to others except for primary purposes. It may be remarked here that no one is allowed in the exercise of secondary or tertiary use to deprive others of primary use.

In conformity with the policy referred to it is provided that no person shall impound, divert or take the water of public streams except for primary purposes unless duly authorised so to do. This authority would be a right to use granted under the Water Ordinances or a right acquired under the common law prior to the passing of the "Water Ordinance, 1913."

It is doubtful whether many rights do exist under the common law. It is suggested that persons having, or believing that they have, such common law rights should apply to have them determined and recorded as provided for by the Ordinance of 1913, or otherwise to apply to have rights in substitution thereof granted in terms of the existing law. It may be mentioned in this connection that rights to the use of water, howsoever acquired, become extinguished if use is not made of them for a consecutive period of three years owing to the neglect or default of the holder.

Persons using water from public streams (use for primary purposes naturally always excluded) without permission, and persons desiring to acquire the right to use such water, should make an application to the Water Registrar, Department of Agriculture, for authority. Such application must be on a prescribed form, which the Water Registrar will supply on request. The Water Registrar, on being furnished with such particulars as to the proposed use of water as he may think necessary, and having given persons entitled to object to such use an opportunity to lodge their objections, refers the matter to the Administrator, who appoints a Water Court to consider and decide upon it. In this connection it may be stated that applicants for the right to use water should be able to satisfy the Water Registrar that their proposed undertakings are practicable, for it is reasonable that the expense of a Water Court should only be incurred in considering schemes that are capable of execution.

A Water Court, in considering an application for the use of water, does not, if acceding in whole or part to the request, grant an unqualified authority, but fixes the conditions on which the use of water shall be allowed, provided the works necessary for giving effect to the scheme are completed within a period specified by the Court. At the end of the period fixed a final grant to the use of water on the conditions prescribed is made on the certificate of an engineer that the necessary works have been carried out. A person failing to complete the required works within the period fixed may, on shewing good reasons for having so failed, be granted an extension of time by the Court. Authority to use water is intended for use, hence it is futile for persons to apply for the right to water with the desire of securing themselves and probably some vague intention of using it at an indefinite future date. Water cannot be reserved in such cases.

Where there are several applications for water from the same stream and the amount available is limited, the Court, everything else being equal, is required to give preference to the first applicant. A Court is, however, bound to take into consideration a variety of factors in each case, its main object being to see that the water is used to the best advantage. For example, if there are several simultaneous applications for water from the same source, the Court would probably decide that it would be better to grant it to one or two who could use it economically on land suited for irrigation, rather than permit its dissipation by many sub-divisions, or sanction its use on land ill adapted for irrigation or which could only be irrigated at great expense.

A Court, in dealing with applications for the use of water, is required to take into consideration the nature and extent of land irrigable from the stream affected, hence it may happen that an application for water may be refused or only granted to a limited extent, although there are no other claimants, if it appears that the land which it is proposed to irrigate is not, for economic or other causes, so suited for the purpose as other land which may not be occupied or occupied by persons too apathetic to make use of the water available. The probabilities of such land being occupied or occupied by progressive men have to be considered.

The common law did not permit of the use of rivers for the irrigation of land not riparian thereto. The Rhodesian law, in pursuance of the policy already mentioned, may permit of water being taken on to non-riparian land if this can be done to advantage.

It sometimes happens that the diverting of water from a river is a very expensive undertaking for one individual, and that the water, if once diverted, would be capable of being used by a number of landowners. To meet cases of this nature and others where combined action may be desirable, the law provides that two or more proprietors of land may unite for the carrying out of a joint scheme of irrigation for their mutual benefit. This is scarcely the place to deal with the procedure necessary to launch such undertakings; it is suggested, however, that they would be of great benefit in many localities. Persons desiring to enter upon joint schemes can obtain the necessary information from the Water Registrar.

As already indicated, the granting of definite rights to use water is conditional on the necessary works for giving effect to such use having been carried out. It should be further noted that definite rights, when granted, are liable to be cancelled or modified if they are not being used or are being used improperly. This is to prevent persons retaining claims to water under the mere colour of rights, especially if there are others able and willing to use it.

The holder of a right to use water may frequently be unable to make use, or effective use, of such right without storing the water on the land of another, leading it across another's land, or putting a dam or weir in a river bed on another's property. The law provides that servitudes, known as servitudes of storage, passage and abutment respectively, may be acquired over another's land to meet cases of this nature. The procedure necessary to obtain such servitudes is laid down in the "Water Ordinance, 1913"; briefly it may be put that a person desiring to obtain such a right from another should endeavour to make an arrangement with him as to the conditions, probably including compensation, on which the right can be obtained; in case of failure to make an arrangement, the applicant should serve a notice on the proprietor of the land affected claiming a servitude and containing the particulars set out in section 52 (1) of the Ordinance. If the claim is not acceded to within a month after service of the notice the applicant can have it referred to a Water Court for decision. It is a condition of all servitudes that they should not impose any greater loss or inconvenience on the person whose land is burdened by them than is absolutely essential for their use.

In order that servitudes may be binding, not only on the parties to them but also on their successors in title, they should be registered in the Deeds Office against the title of the land affected.

Rights to water for mechanical, industrial or power purposes may also be acquired under the law. Applications for such rights should be forwarded to the Water Registrar in the first instance. The law requires that water used for these purposes should be returned to its stream undiminished in quantity and unaffected in quality except in so far as caused by the use to which it has been put.

In conclusion it may be added that the Ordinances of 1913 and 1920 do not derogate from or affect the provisions of the special laws whereunder rights to use water for mining or railway purposes may be acquired.

Napier Fodder.

IS IT APPRECIATED IN RHODESIA?

The attention of the farming world was first drawn to the value of Napier fodder (*Pennisetum purpureum*) as a perennial fodder and pasture plant in the pages of this *Journal* some ten years ago. Since then it has been introduced from Rhodesia into many other countries, and from time to time extracts have been published by us which plainly indicate its growing popularity in parts of the U.S.A. and Australia. In this issue we gratefully acknowledge a kindly tribute from Mr. George Valder, Under Secretary for Agriculture, New South Wales, who, while thanking us for the introduction into Australia of Napier fodder and Kikuyu grass, states that both these plants give promise of proving of great value to the farmers of his territory. Simultaneously the *Pacific Rural Press* reaches us containing a stimulating article—which we reproduce below—regarding the important place which Napier fodder is commencing to take in Californian agriculture.

In view of these facts, it may well be asked whether we, as the introducers of this fodder plant, are ourselves devoting sufficient attention to it. As a farming community, especially in respect of grasses and fodder crops, we are prone to be somewhat exacting, and there is no doubt that Napier fodder would be better appreciated by us to-day if it had generally received more sympathetic treatment. It is very seldom grown under irrigation in Rhodesia, and still less often is it manured. On the other hand, it is frequently seen growing on the poorest and dryest of soils, receiving scant attention, and still often producing the only green and succulent, though meagre, growth on the farm in mid-winter and early spring. If capable of doing this under unfavourable conditions, it is not difficult to realise the great quantity of green feed it will produce during winter if occasionally irrigated and manured. The glowing tributes paid to Napier fodder in California, where it receives such attention, can therefore readily be understood.

In this country, however, and even without irrigation and manuring, much can be done to increase its yield. All too frequently, on account of the superabundance of grass during the wet season, our Napier fodder patches are neither cut nor grazed. The plants attain their full growth during summer, complete their annual cycle by flowering and setting seed, and thereafter remain more or less dormant during winter. If, however, kept cut or grazed each time they reach a height of 2 to 3 feet during the rainy season, the plants will be found to be more vigorous and to make better winter growth. Experience has also shewn that on dry land young plants make very much stronger winter growth than do three and four-year-old plants. Old plants become matted and portions of the stools die out, while the remainder lose vigour. To secure the best results, therefore, the stand, if not irrigated and manured, should be replanted every third or fourth year, and above all the plants should be kept cut or grazed during the wet season.

The following is the extract from the *Pacific Rural Press*:—

"The forage plant that will grow two inches per hour ought to make a hit with all feeders of live stock, goats, rabbits and poultry. It happened to be an extensive goat raiser, Miss Annie Wheeler, of the Sycamore Heights' Goat Ranch, in Los Angeles county, who unexpectedly gave to both of us a demonstration of the remarkable growth pressure there is in the roots of Napier grass. She was cutting some three weeks' growth thirty to forty inches long for her goats when the writer appeared on the scene. Each clump of ten to thirty stalks was cut off square with a knife close to the ground. An hour later those stubs were not square across—they had pushed their centres into growth varying generally between one-eighth and one-quarter inch on each stalk. Mathematically, with sixteen stalks per plant averaging one-eighth inch growth in an hour, each plant had made two inches growth. That was done on 19th July. On 1st July these same plants had been cut back to the ground, the growth then measuring over three feet long. The same plants had been cut back to the ground about the middle of June, six weeks after they were set out, averaging then about 30 inches length and 15 to 20 stalks per hill! In the next six days they grew 14 inches length of leaves. It's a fairy tale all right, but it's a true one.

"The plants had been set out on coarse, sandy soil about 1st May as single root divisions. Each successive cutting had made more numerous stalks start from buds in the crown, which was thus enlarged, while at the same time making even greater length growth of leaves. We counted one no better than the average, and it had 27 stalks. These stalks are finer than those of gyp corn, the same height, and are of succulent leafy nature to the centre. The leaves are finer than those of gyp or milo. Fortunate is Miss Wheeler in having her three rows, perhaps 150 feet long, for the big herd of milk goats she handles. Though the goats have considerable hill range, most of that is brown now except the brush ; and Napier grass is their chief green feed.

"But the large herd needs more of it. For this reason, even while cutting for feed, Miss Wheeler is dividing many of the plants and setting them out in new rows. Twenty-six plants one year old made 625 crown-divisions each with one to three stalks for a starter. It was about 1st July that she divided enough of her old plants to set out 1,100 new ones. There will be a wilderness of feed if she doesn't cut it every two or three weeks. An easier, cheaper way to feed now being considered is to fence it off into small plots and turn the goats on to avoid the labour of cutting and hauling.

"What the Napier grass does when it is not so frequently cut back can be seen better on the place of Eugene Spencer, also in Los Angeles county. Here we saw a dense jungle of this year's new shoots averaging easily seven feet tall in mid-July, much of it nine feet tall. Mr. Spencer said it would be fourteen or fifteen feet tall before summer is over. These stalks are hairy and coarse, but succulent all the way through. The leaves were almost as big as corn leaves. Late in the season the stalks become harder and form joints. That growth is not particularly good feed, but the mature jointed stalks make the cheapest reproduction. One clump of them, whose root crown is three years old, was allowed to stand through last winter along with canes from some younger plants. About Thanksgiving came a frost which killed the tops back a couple of feet, but the plants grew at warm times during the next two months about eight inches. About 1st February came a very heavy frost, which froze the rest of it half to the ground or more. Most of the mature stalks were then cut off at the ground, but some which were left are now bristling with a densely multiplied growth of fine, many-branched shoots from each of the upper joints. This makes a lot of fine feed, but not so much as has come up from roots whose canes were cut back to the ground.

"Mr. Spencer plants in most all months of the year successfully ; but he advises spring planting after frost danger is over. One lot of crown divisions was transplanted last September. They made three or four feet of growth and froze back to the ground. Last spring he forked the dead stuff off, and early this July they were a dense mass of good strong green feed averaging five feet tall.

"Several rows of crown divisions planted last March had been neglected afterward and were only two feet tall, no better than cane joints planted somewhat later. Surplus plants averaging twenty to forty new single-stalk divisions per plant set out last April and May have now multiplied from the single stalks to twenty to thirty per plant. Miss Wheeler's divisions planted about 1st July were making a perfect stand, and were getting well established three weeks later.

"Last August or September Miss Wheeler transplanted two Napier grass plants to a dry, hot, steep, barren southern slope on her goat range, watering them from her canteen and covering them with wild brush for protection from sun and beast. About a week later she watered them again from her canteen and gave them no more attention. Last spring, when she looked at them a rabbit or gopher had gotten one, but the other had made a shoot about a foot long. More experiments of similar nature are to be tried with the first spareable plants, for Miss Wheeler believes that it will do better than other feed on the natural ranges.

"However, it may be said that one who lets Napier grass lack water is losing a valuable opportunity to get much forage by adding a little water to his other expenses of production, which will remain about the same, whether the yield is small or big.

"There is no doubt in the writer's mind that with fair soil and plenty of water, Napier grass produces more summer forage than any other plant in California. We would not recommend dry culture, nor would we expect much growth in cool or cold weather. Other plants better adapted for such conditions will make better tonnage there. Nor is there any doubt that it will make as valuable a green feed ton for ton as any of the non-leguminous forage crops grown in the United States. Nor is there any doubt of its palatability to all kinds of live stock. As a hay plant, it is handicapped by the size of its stalks and their habit of growing in clumps. This would be at least partially overcome by thick planting and frequent cutting, but the mower would have a rough road to travel. It now appears that the best way to feed it is to graze it. Grazing can be abusive, however, as seems shewn by Mrs. Galbreath's two or three acres in Tulare county. She had a magnificent growth there in 1919; but all of last spring her dairy cattle kept it eaten off short, sheep being on it when the writer called early in July; and it had not been irrigated this season. Only a few plants seemed to have escaped long enough to throw out a little new growth in that mass of Bermuda grass; and it was not convenient to determine whether the remainder was alive or dead. However, we give it the benefit of the doubt, for one clump which had been dug out in spring and left on top of the ground had sent roots into the soil beneath and would probably have continued growth.

"Much of success with Napier grass depends on giving it the right start. Whether planting cane cuttings or crown divisions, they ought to be set deep and kept moist but not soggy until they become estabilshed.

"Seed from Napier grass is absolutely no good commercially on account of scant production and poor germination. To make either canes or crown divisions grow, it is essential to keep them good and moist. In planting canes, they are laid lengthwise end to end in a furrow deep enough so they may be covered two or three inches and still leave half the depth of the furrow through which to irrigate. Later the new shoots may be separated and transplanted farther apart.

"To get crown divisions, insert a spade full-depth all around a plant, then tip it over, pull it out, and pull the shoots apart with the fingers. To cut them apart destroys too many. Mr. Spencer leaves only one shoot per plant generally; Miss Wheeler leaves two or three. Each shoot has enough roots to become established most any warm time of year if enough moisture is furnished, and especially if the tops be partially cut back at transplanting and more or less shade given when the work is done at a hot time of year. Miss Wheeler says that a plant will be ready to sub-divide six weeks after transplanting. Mr. Spencer says that he gets three generations of sub-divisions per year when desirable.

"In a permanent feed patch, they should be about 3 x 6 feet apart, but Miss Wheeler is planting about 18 inches apart in rows three feet apart, because she cuts it off so frequently and does not want to cultivate a big interspace. Thus, also, when she sells plants, she will simply thin out her producing patch to get them. Mr. Spencer also plants close on account of his business of selling the crown divisions.

"The rooted divisions may also well be set in furrows. After irrigating through the furrows, dirt may be turned into them, leaving another furrow on each side of the row for future irrigations and cultivations. Roots should be six to eight inches below the level surface soil, according to Miss Wheeler, partly to avoid freezing, partly to avoid heating and drying out in summer.

"For the conditions mentioned, we doubt if there is a better plant for production of green summer forage in California than is this Napier grass, but we have seen no reason to recommend it for dry conditions."

The Fowl Tick.

(Argas Persicus.)

By A. LITTLE, Poultry Expert.

This is undoubtedly the worst insect that the poultry keeper has to contend with, and is accountable for more deaths of fowls and greater loss to the poultry industry of the country than any other insect or disease. It is often wrongly termed the tampan, which, although a tick, is quite different to the fowl tick both in shape and size (as will be seen from the accompanying illustration)* and also in colour. The tampan (or *inthodoros moubata*) is not nearly as plentiful in South Africa as the fowl tick ; it usually occurs in desert tracts in the shade of trees and rocks, and in native huts, and is parasitic upon man, causing relapsing fever or tick fever in Central and East Africa, the Congo and Angola. The eggs are laid in the sand or hollows made in the ground by the females. The fowl tick, on the other hand, is unfortunately very common, and widely distributed throughout South Africa ; it is found in fowl houses, coops, etc., and under the bark of trees in close proximity to poultry. It is essentially a parasite of fowls, but it is sometimes found on ducks, geese, turkeys and pigeons. It also causes a disease in fowls which, for want of a better name, is called Spirochætosis, for the reason that it is the transmitting agent of the fowl Spirochæte, which is usually fatal to fowls. The female usually lays its eggs in the cracks and crevices of a fowl house or under the bark of trees.

There is not much doubt that the fowl tick was introduced into South Africa from India ; it is also found in Australia and New Zealand, into which countries some say it was introduced from South Africa. It is unknown in cold damp countries, but it thrives and multiplies rapidly in hot, dry climates. The majority of poultry keepers are quite unaware that these fowl ticks are present in their poultry houses. It behoves everyone to keep a constant watch for them, and to use all means in their power to keep their birds and houses free from them, and if present, to get rid of them as soon as possible.

Methods of Detection.—The fowls are usually pale in face, the comb is pale and shrunken, they are listless, lay few or no eggs, or sicken rapidly and die. If small dark specks, similar to small ink blots, are seen around cracks or crevices in the wood, iron or brick work of the house or on the perches, it is practically a sure sign the fowl ticks are present. If the blade of a knife be inserted in the crack, blood will be found on it, and if the crack is enlarged the fowl tick will be found to be present. As the adults feed only at night, retiring to the cracks during the day, they will be seen after dark crawling about the walls or perches or feeding on the fowls.

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*The plate is not reproduced in this issue.

Appearance of the Adult Fowl Tick.—Oval in shape and flat, with eight legs, two on each side near the head and two on each side of the middle of the body. In colour, when not engorged with blood it is dark brown, with a distinct light brown margin round the body. After a long fast they have the appearance of small light brown withered leaves; when engorged with blood they lose their flattened appearance, and become a darker brown (almost a bluish brown) in colour.

Life Cycle of the Fowl Tick.—The adult female lays batches of eggs, in numbers varying from 20 to 100, at the rate of several a minute, in a crack or crevice of the house or coop or under the bark of a tree. These hatch in about three weeks, and we have the larvæ, little bigger than a pin's head and almost impossible to see with the naked eye. Under a magnifying glass, they appear round in shape, of a grey translucent colour and with six legs. They immediately crawl about in search of a host or are taken after dark on the backs of the adults. *They remain on the fowl day and night* from five to ten days, according to the temperature, feeding on the host and conveying the disease alluded to above. Having become engorged with blood, they become dark brown in colour and oval in shape; they drop off, hide in a crack or crevice and moult into nymphs. The fact that they are so small as to be unnoticeable to the naked eye often leads the poultry keeper to imagine his birds are not affected. During the moult they grow a fourth pair of legs.

There are two nymphal stages; the first lasts about three weeks, the second about five weeks. They then moult into adults. During the two nymphal stages and the adult stage they leave the cracks after dark and return again before it is light, therefore *in these stages they are never seen on the birds except at night.* They are rapid feeders, taking about 1½ hours to become engorged. The adult females feed more plentifully than do the males, and usually once a month during the warm weather, after each meal they lay a batch of eggs. From egg to egg stage lasts about ten months. The fowl tick can exist for a very long period without food, the larvæ for seven to eight weeks, the nymphs a year, and the adults for two or three years. This accounts for the fact that if birds are put into a house in which there are fowl ticks, but which has been empty for two or three years, they will, immediately it is dark, be attacked. It is therefore imperative that all poultry keepers should thoroughly investigate the house before putting in new birds; a good method of ascertaining whether ticks are present is to put in at night two birds of little value, and later go in with a light and see if ticks are present.

Methods of Infection.—Adult ticks will gradually pass along fences or trees, and so from one poultry house to another. This is one of the usual methods of their spread in suburbs of towns. In Australia it is prohibited by law to allow these fowl ticks to infest houses, birds, trees, etc., or to sell poultry so infested or even from infested premises. Such fowls, crates, etc., so infested are immediately destroyed and the owner is liable to a heavy fine. In Rhodesia we have now a law dealing with the same matter, giving the right of inspection of premises. Another common cause of infection is by tick-infested coops, sacking, crates and fowls sent from one centre to another.

Cause of Death is Tick Fever (*Spirochætosis*).—The cause of death is not due, as the majority of poultry keepers imagine, to weakness caused by loss of blood, although the loss of blood does weaken the bird and lowers its vitality, making it still more prone to the disease. The fowl tick, as mentioned above, is the host of an organism called the Spirochæte, which, when the blood is being sucked, passes into the system of the fowl, causing the disease, the symptoms of which are prostration, ruffled feathers, high temperature, loss of appetite, thirst, rapid emaciation and diarrhœa of a greenish yellow colour. If the bird is treated at once by destroying the ticks, *i.e.*, the larvæ, by dipping the fowl in a solution of warm water and two tablespoonfuls of Jeyes' Fluid, Kerol or similar disinfectant, and removed to clean quarters, it will probably recover, although as a rule the disease has developed to such an extent before it is noticed by the poultry keeper and there are so many organisms in the blood that there is little hope of recovery; however, if recovery takes place the bird becomes immune. We thus find birds apparently well and in good health, although not as productive as they should be, in houses infested with these ticks, but if other birds which are not immune are introduced these immediately sicken and die. One often hears the remark, "I bought birds (it may be pure-bred or otherwise) from so and so, and soon after I had them they sickened and died, while my own birds seemed quite healthy." Of course the seller is usually blamed, and his or her birds said to be delicate. The reason is obvious, and is one of the causes why pure-bred birds which probably have never been in the vicinity of a fowl tick in their lives are so often—and quite erroneously—by some people considered delicate.

Methods of Destroying the Fowl Tick.—System, perseverance and patience are necessary to get rid of this pest. Some recommend burning tick-infested houses. This is rather an expensive method if the house is of wood or brick; if of grass or straw or similar material, the loss is not great, and this procedure is recommended. If of iron (and, contrary to the usual idea, an iron house will harbour ticks under the overlapping sheets and similar hiding places), a quantity of straw can be placed inside and fired and the house made as hot is possible. In the case of brick or wooden houses, the best method is to use first a plumber's blow lamp, and direct the flame into all the cracks and crevices, then spray well into these a 20 per cent. solution of water, as hot as possible, and Jeyes' Fluid or similar disinfectant, or a similar solution of paraffin and soap suds. The same night put several birds into the house and go after dark with a light, and if any ticks are noticed, repeat both oprations next day and each day until no ticks are discovered after dark. Coops, crates, nest-boxes, perches, etc., should be immersed for several days in a dipping tank or solutions as given for spraying. All trees infested should be cut down, and fences, etc., removed. The ground on which the houses stand should be saturated with paraffin.

Other disinfectants that can be used, although more expensive than the above, are :—

- A 10 per cent. solution of carbolic acid; but great care must be, of course, used when employing this.
- A 20 per cent. solution of lysol.
- A 20 per cent. solution of milk oil fluid.
- A 10 per cent. solution of caustic potash or soda ; care is required too in using this.

Preventive Measures.—Wood for wooden houses should be well painted before construction with solignum, carbolineum or similar preparation. All houses should be sprayed every fortnight in hot weather and every month when it is cooler, and the spray forced well into the cracks or between any materials that overlap. All perches, nest-boxes, etc., should be movable. Strict cleanliness is a *sine qua non.* All new arrivals should be at once dipped, and all birds dipped at least once a month. Coops and crates arriving from other quarters should be immersed in disinfectant solution for several days. Nearest neighbours should be urged to follow these precautions.

Keep the birds strong, healthy and vigorous, and not over-fat. The reverse of this condition lowers their vitality, and causes them to be more susceptible to the attacks of ticks. As long as ticks are present, it is unsafe to keep poultry, and the financial loss is often great ; certainly it means the difference between profit and loss. If each farmer and poultry keeper would do his share to eradicate the tampan from his premises, we should soon see a vast improvement in the quantity and condition of the poultry of the country.

Control of Temperature in Dairying.

By T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

Two factors above all others make for success in dairying. These are cleanliness and control of temperature. The necessity for cleanliness has been preached in and out of season for years, and seems to be appreciated as a general rule in Rhodesia. There is, however, much to be done in the production of clean milk, and no great advance in the quality of Rhodesian dairy products can be expected until such time as milking sheds with impervious floors become more common.

One would imagine that in a semi-tropical country like Rhodesia, greater efforts would be made to control temperatures throughout the summer season, but even where butter is made little interest seems to be taken in temperatures, and the dairy thermometer is generally conspicuous by its absence. It cannot be too strongly impressed on farmers that the use of the thermometer is as important in dairying as it is in veterinary practice if success is to be attained. Success in all branches of dairying, then, depends on four essentials:—

1. The production of clean milk.
2. The erection of a cool dairy.
3. The provision of a clean, cool water supply.
4. The constant use of a reliable dairy thermometer.

The Construction of a Cool Dairy.—Too much care cannot be exercised in the construction of a dairy. It need not necessarily be expensive or elaborate, but it should possess the following features:—

1. An impervious concrete or stone floor constructed with a fall to a concrete sump situated outside the building.
2. Cavity or thick stone walls.
3. A thatched roof.
4. An insulated ceiling.
5. Ample ventilation both above and below the ceiling.
6. Double fly-proof door on the south side.
7. A verandah extending all round the building.

In the writer's opinion the most important of these features, so far as the control of temperature is concerned, are: (1) the provision of a verandah shading the walls all round the building, and (2) the provision of an insulated ceiling. An insulated ceiling may be constructed of either ordinary ceiling board, or, if cheapness of construction is to be considered, of reeds covered with an inch layer of "dagga." This latter forms a good insulating medium. The insulation in the case of a wooden ceiling may be a 4 inch layer of either grass, sawdust, well washed charcoal or asbestos. The objection to grass is that it harbours vermin; and if available one of the other insulating media should be used. To prevent dust making its way through the crevices of the ceiling, thick brown paper or newspapers should be spread before the insulation is laid down, or in the case of the reed ceiling calico can be fastened underneath. Ventilation should be provided by leaving an opening between the thatch and the wall, and over this opening wire netting should be fixed to exclude rats or other vermin.

A dairy on these principles has been constructed for the Enkeldoorn Co-operative Cheese Factory. The insulation both of walls and ceiling has proved so effective that even in the hottest weather, the temperature of the cheese store room seldom, if ever, exceeds 70 deg. F. In similar buildings constructed without an insulated ceiling, the temperature often exceeds 80 degrees. Double walls or the building of a verandah are almost useless unless the roof itself is insulated. The reason for this of course is that the sun is practically overhead during the summer months, and this feature alone will make a difference of at least 10 degrees in the temperature. It is obvious that an insulating medium which excludes heat will also tend to retain it, and therefore the ventilation of the dairy should be ample. Often it is found that the temperature of the dairy in the early morning is higher than the atmospheric temperature. In that case, dairying operations, such as churning, should take place out of doors, and the possession of a roomy verandah in this event is all the more appreciated. If native grass mats are hung up, and the sun prevented from beating on to the walls in the late afternoon and early morning, additional protection and insulation will be afforded.

The Provision of a Cool Water Supply.—This can be arranged even in the hottest weather by means of water bags or the exposure of the water in a canvas bath to the night atmosphere. The principle of producing cold depends on a phenomenon known as "latent heat." When evaporation takes place it requires 966 units of heat per pound of water to convert the water into vapour. These units of heat are extracted from surrounding objects, and in the case of the water bag from the water itself. Naturally if evaporation is rapid, for instance when a good breeze is blowing and the sun is shining brightly, more units of heat are required than if evaporation is slow, and the water becomes cold more rapidly. Therefore, the larger the surface of water exposed to the night atmosphere, as in the case of the canvas bath suspended on a frame, the greater will be the evaporation and the greater the cold produced.

Some observations taken in Salisbury may perhaps be of interest:—

Original temperature of water.	Temperature on being exposed to atmosphere in canvas bath for eight hours.
79° F.	59° F.
78° F.	60° F.
75° F.	61° F.
77° F.	62° F.

The variations in the resulting temperature are of course due to difference in atmospheric conditions, etc. Better results can be got by exposing the water bag to bright sunshine on still days than by keeping it in the shade. The addition of salt to the cold water at the rate of about one pound to ten gallons will have the effect of still further lowering the temperature and maintaining the low temperature for some considerable time. This brine can be used with advantage, as will be described later, for thinning the cream before churning, and especially for washing and brining the butter in hot weather.

(To be continued.)

A Calendar of Farm Crop Sowings.

By C. Mainwaring, Agriculturist.

The aim in issuing this sowing calendar is to provide farmers, and more especially new settlers, with guidance as to seasonable sowing operations on the farm. The season, however, properly determines the date of plantings, but it is hoped that this calendar will be suggestive to the beginner, to whom any fixed points or standards, of whatever kind, are valuable in enabling him to plan his work. The farmer long accustomed to a locality depends less on a calendar than on the general state of the weather and the "signs" of the season. Rainfall and climatic conditions vary so much in different districts of the Territory that it is not possible to fix arbitrary dates of seeding. In regions of light rainfall special attention should be given to the preparation of the seed bed. Almost all crops thrive better when drilled than when broadcasted, since the seed, being planted at a uniform depth, germinates more evenly, and cultivation is rendered easier.

Barley (winter irrigated or on moist vlei soils) for grain—May—60 lbs. per acre.

Barley (winter irrigated or on moist vlei soils) for pasturage—February to March—80 lbs. per acre.

Beans, Haricot—Mid-November to January—40 lbs. per acre, drilled in rows 2 feet by 8 inches.

Beans, Velvet (for hay or seed)—Mid-November to December—25 lbs. per acre, planted in rows 3 feet by 10 inches.

Beans, Velvet (for green manure)—Mid-November to January—25 lbs. per acre, planted in rows 3 feet by 10 inches.

Beans, Kaffir, or Cowpeas (for hay or seed)—Mid-November to December—20 lbs. per acre, rows 3 feet apart.

Beans, Kaffir, or Cowpeas (for green manure)—Mid-November to January—30 lbs. per acre, in rows 2 feet apart.

Beggar Weed—Mid-November to January—15 lbs. drilled, 20 lbs. broadcast.

Buckwheat—January—30 to 40 lbs. per acre, broadcast.

Dhal (for grain)—Mid-November to December—6 to 8 lbs. per acre, drilled in rows 3 feet apart in a frost-free situation.

Dhal (for green manure on the sand veld)—Mid-November to December—20 lbs. per acre, drilled or broadcast.

Ground-nuts (Spanish Bunch var.)—Mid-November to December—30 lbs. shelled seed per acre in rows as near as will allow easy tillage;

Spanish Bunch is superior to other varieties grown both for forage and seed production.

Hibiscus (for fibre)—November to December—40 to 50 lbs. per acre.

Kaffir Corn—Mid-November to December—5 lbs. per acre, planted in rows 3 feet by 12 inches.

Linseed (for seed)—Mid-November to January—16 to 20 lbs. drilled, 25 to 30 lbs. broadcast.

Lucerne (irrigated)—April, May, June—15 lbs. drilled, 20 lbs. broadcast.

Maize (for grain)—Mid-November to 15th January—12 lbs. Salisbury White, 15 lbs. Hickory King per acre, rows 40 by 18 inches.

Maize (for ensilage)—Mid-November to January—25 lbs. per acre drilled.

Maize and Velvet Bean Mixture, (for ensilage)—Mid-November to December—15 lbs. of velvet beans planted in rows 3 feet by 12 inches, to be followed a fortnight later with 15 lbs. of maize, planted as close to the rows of velvet beans as possible to allow space for cultivation.

Mangels—December to January—8 lbs. drilled in rows 2 feet apart and plants thinned out to 10 inches in the row.

Mangels (irrigated or on moist vlei soils)—February to April—8 lbs. per acre, drilled in rows 24 to 30 inches apart, or sown in seed bed and transplanted. Mangels require a rich and well prepared soil to succeed.

Millets or Manna—December to February, according to variety—15 to 20 lbs. broadcast.. Boer manna matures in about 135 days.

Oats (winter irrigated or on moist vlei soils) for grain or forage—End of April to May—65 lbs. per acre drilled.

Oats (summer)—Beginning of January—50 to 60 lbs. per acre; suitable varieties, Burt or 60-Day.

Oats (on moist vlei soil for pasturage)—February to March—70 lbs.

Oats—Sown broadcast in maize crop during last cultivation of maize for winter grazing—60 lbs. per acre.

Oats with Black-eyed Susan Peas (for hay)—January—50 lbs. oats, 30 lbs. peas, sown broadcast and disced in.

Peas, Field (Black-eyed Susan var.)—Mid-November to mid-January—60 to 70 lbs. per acre, drilled in rows 2 feet apart with planter.

Potatoes (early)—End of July to September—1,000 lbs. per acre, planted in rows 2 feet by 1 foot.

Potatoes (main crop)—November to the beginning of February—1,000 to 1,200 lbs. per acre, according to size of seed.

Pumpkins and Cattle Melons—November to mid-December—4 lbs. per acre, 8 feet by 8 feet between the plants.

Rye (on moist sand vlei soil for green fodder)—April to May—45 to 50 lbs. per acre.

Rye (irrigated or on moist sand vlei soil) for grain—May—45 to 50 lbs. per acre.

Rice—November to December—40 to 60 lbs. per acre.

Sudan Grass (for hay)—Mid-November to January—20 lbs. broadcast.

Sudan Grass (for seed)—December to January—10 lbs., drilled in rows 2 feet apart.

Sunn Hemp (for fibre)—December—60 lbs. per acre.
Sunn Hemp (for green manuring)—December to January—30 lbs. per acre, drilled or broadcast.
Sunflower, Black—Mid-November to December—10 to 12 lbs.; sow in drills same as for maize and thin out plants to 12 or 15 inches apart.
Sugar Beet (irrigated)—February to March—15 to 20 lbs. per acre, sown in drills 2 feet apart.
Sweet Potatoes (cuttings)—Mid-November to January—in rows 3 feet by 2 feet.
Teff Grass—Mid-November to February—6 to 8 lbs., broadcast with grass seed, harrow drill.
Vetches (on moist vlei soils for pasturage)—March to May—25 to 30 lbs. per acre.
Wheat (winter irrigated or on moist vlei soils) for grain—May—50 to 60 lbs.

Grasses.

Napier Fodder (cuttings or root divisions)—Any time during the rainy season, in rows 3 feet by 3 feet apart.
Kikuyu Grass (cuttings or root divisions)—Any time during the rainy season, in rows 2 feet by 2 feet or closer.
Molasses Grass—Sow in shaded seed bed in January and transplant the following rainy season in rows 2 feet by 2 feet apart.
Paspalum (on black turf vleis)—December to January—15 lbs. seed per acre, broadcast.

Internal Defence.

By Major G. Parson, D.S.O., Chief Staff Officer.

Few residents in the outlying districts are cognisant of the details of the Commandant General's scheme of internal defence which is now being applied to the Territory, and in order that everyone should have some idea of the organisation, the following notes are published in the hope that readers of the *Agricultural Journal* will pass them on to anyone interested in the scheme.

The first consideration naturally was to decide in what manner the residents could be drawn into places of safety, where mutual support would enable them to take care of themselves until assistance was forthcoming.

General Edwards decided to apply the organisation which was adopted some years ago in India, and which was intended to meet practically identical emergencies as are possible in this Territory.

The scheme generally is as follows:—The Territory has been divided into eight military districts, which in their turn have been further sub-divided into sub-districts and sections. Each district will be under the command of a District Commandant, and under his orders will be the Sub-district and Section Commandants.

At the present moment temporary appointments have been made to the military districts and Police officers selected, because they have the machinery wherewith to obtain all the necessary information as to the numbers and locality of residents.

It is the Commandant General's intention to eventually hand over the command of these districts, sub-districts and sections to the residents of the country wherever it is possible and convenient to do so. This has actually been accomplished in the case of the Umtali, Bulawayo and Charter Districts, where Lieut.-Col. Methuen, D.S.O., Lieut.-Col. Brady, D.S.O., and Major Chomley, D.S.O., have been appointed Commandants.

A condition of the appointment to a Commandantship of a district, sub-district or section is that the officer appointed must be a member of the B.S.A. Police or of a rifle company.

In each sub-district a central and convenient place will be selected for the sub-district laager, and similarly a rallying point will be chosen for each section. The rallying points will be strategically situated as far as possible, so as to form a cordon of posts round the sub-district laager.

In time of emergency it will be incumbent on all residents, as soon as warning is received from the Section Commandant, to move with all speed to the rallying point. The women and children will be sent in from there as soon as possible to the sub-district laager, the men remaining out to patrol the area evacuated by them and to keep in touch with adjacent rallying points.

The first duty of the single men is to help the married men with families to reach the rallying points.

It is quite impossible to say how long the men at the rallying points will have to remain at their posts, circumstances alone can decide this; but the general idea is that as these are outlying defensive posts of the main laager, as such they should be held as long as possible, so as to afford protection by preventing an enemy closing in on the laager. Again, if it is found possible to hold the outlying posts, they will afford protection to stock, which will be kept inside such cordon.

It should be noted that this strategic arrangement of rallying points accomplishes a further object, in that in co-operation with the rallying points of other sub-districts they form a cordon of outposts round any danger zones, thus enabling an enemy to be closely watched and pinned down until such time as a striking force can arrive on the scene.

It is also to be noted that the general scheme provides only for those districts, sub-districts and sections actually in the danger zone being mobilised in time of emergency; therefore, only such districts, etc., as are in close proximity to the seat of danger will be called out; others will be mobilised as they become affected.

This is broadly the scheme of internal defence which is now being applied to the Territory.

The question naturally will be asked where the striking force is to come from. The B.S.A. Police is rapidly being brought to pre-war strength, and a scheme of mobilisation exists which provides for the concentration of a number of the men within 48 hours, and the balance within a further 48 hours. In addition to this, it must be borne in mind that the Volunteers have not ceased to exist as a whole. Those units which have been disbanded are being replaced by rifle companies.

At the more important centres cadres are being formed; these are merely the framework or skeleton of a military unit. There will be infantry cadres, machine-gun cadres, transport cadres, medical cadres, and so on. The personnel of these cadres will be members of a rifle company who are seconded to a particular cadre, and will be trained men in their particular work. The establishment of the various cadres will depend on the requirements of their particular centre.

The personnel of these cadres will be required to maintain their efficiency by lectures, and partaking in such staff rides and tactical exercises locally as the Commandant General may think expedient, and whenever possible and convenient to accompany a Police mobile column. In times of emergency the establishments of these cadres will be completed from members of the rifle company and others who volunteer for the work. They will thus form a useful addition to the striking forces.

To revert to the scheme of internal defence as outlined at the beginning of this article, it must be noticed that there is nothing compulsory about it. Residents may or may not agree to conform to the orders, but in the latter case they must realise that if they do not, they will be the last to whom protection can be afforded.

The first consideration is to rally for mutual support at some selected defensive site, and once this has been accomplished and circumstances permit of it, to get the women and children to the sub-district laager, whilst the men remain out to form a protective cordon round the laager.

Unless everyone agrees to fall in with the Commandant General's scheme, which is put forward simply and solely in the interests of the people themselves, the usefulness of it naturally suffers in proportion to those who hold aloof. The key word of the scheme is "co-operation." It is hoped, therefore, that everyone will realise the necessity of complete co-operation. Once such co-operation is assured in time of peace, the security of the resident is practically ensured in time of war, rebellion, etc. Further assistance and relief, if needed, will be forthcoming from the striking forces.

It may be that some will ask for further enlightenment on points insufficiently elucidated, and in this case, if they will communicate with the chief staff officer, Defence Department, Salisbury, particulars will be supplied.

Price List of Forest-Tree Transplants, Ornamental Shrubs, Hedge Plants and Seeds

OBTAINABLE FROM THE FOREST NURSERY, SALISBURY

1. Transplants of forest trees, etc., as far as in stock, are obtainable at the subjoined rates.

2. Orders should be addressed to the Director of Agriculture, Salisbury.

3. All orders must be accompanied by a remittance in cash, bank note, postal order, draft or cheque, made payable to the Director of Agriculture, Salisbury.

4. All transplants are despatched at 3rd rate on railways at purchaser's risk. The transplants are watered as far as this is possible by the railway staff, but trees may be despatched, if desired, at special (perishable) rates, when the railway company is responsible for delivery.

5. All prices quoted are free on rail at Salisbury Station. Consignments to stations are despatched carriage forward. Consignments to sidings will be paid for at Salisbury and accounts for railage submitted.

6. Purchasers of trees contained in tins, either 25 or 4 trees, are required to return the tins. If the tins are not returned within a month they will be charged for at the rate of 6d. each.

7. No trees will be reserved unless specially booked. Orders will be executed in order of receipt as trees are ready for despatch. Every effort will be made to comply with instructions of purchasers.

8. Transplants of forest trees, when quoted at per 100, are grown in half paraffin or petrol tins containing 20 to 25 transplants. The average weight of each tin is about 25 lbs. Height of transplants about 3 to 9 inches.

9. Transplants of larger size, from 1 foot to 3 feet, are also supplied four in a tin at per tree. Weight of tin, about 25 lbs.

10. Shrubs and ornamental plants in single tins have a weight of about 5 lbs.

11. To purchasers of forest trees the following reductions are made:
   (a) when the number exceeds 1,000, the price is £3 per 1,000;
   (b) when the number exceeds 5,000, the price is £2 10s. per 1,000

12. Orders for seed should include the cost of postage.

13. Though every care is taken to supply trees and seeds true to name and of good quality, no guarantee can be given in this respect, more particularly in regard to seed.

14. Intending tree planters are invited to apply to the Forest Officer, Department of Agriculture, Salisbury, for advice as to the most suitable trees for growing in the various climates and soils of the Territory, and on the best methods to adopt in the formation of plantations, windbreaks and shelter belts.

15. From time to time a list of plants ready for delivery is published in the *Agricultural Journal*. This list may be had on application to the Department.

November, 1920.

EVERGREEN TREES.

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Anona reticulata	Custard apple	Fruits freely, but cannot stand much frost	6d. each	...
Callitris calcarata ...	The black pine	Hardy tree; ant resistant; yields good timber; useful as a wind break	8/4 per 100	15/- per lb.
Callitris robusta	White cypress pine ...	Hardy tree; slow growing; ant resistant; timber durable; useful as a wind break	8/4 per 100	15/- per lb.
Casuarina cunninghamiana ...	Beefwood	Large, quick-growing tree; useful as a shelter belt	8/4 per 100	...
Castanospermum australe ...	Morton Bay chestnut ...	Large, evergreen tree with dense foliage; produces orange-red flowers close to stem	2/- each	...
Cinnamomum camphora ...	Camphor tree	Evergreen tree with ornamental, camphor-scented foliage; requires deep soil	6d. each	...
Cupressus arizonica ...	Cypress	Hardy, evergreen tree suitable for dry parts of the Territory; timber valuable; also useful as a hedge plant	8/4 per 100	...
Cupressus funebris ...	Weeping cypress ...	Slow growing, ornamental tree ...	8/4 per 100	...
Cupressus lusitanica ...	Portuguese cypress ...	Handsome, quick-growing tree; timber valuable; requires moist situation; also useful as a hedge plant	8/4 per 100	5/- per lb.
Cupressus sempervirens (var. horizontalis)	Common spreading cypress...	Hardy cypress; requires well-drained soil	3d. each	...

Cupressus sempervirens (var. pyramidalis)	Common upright cypress	Hardy cypress; seems to do well on granite soils	3d. each	...
Cupressus torulosa	Himalayan cypress	Valuable timber tree; ant resistant; fairly rapid growth; many fine specimens of this tree are seen in Salisbury	8/4 per 100	10/- per lb.
Eucalyptus amygdalina	Peppermint gum	Quick and straight-growing; requires good, moist conditions	8/4 per 100	...
Eucalyptus botryoides	Botryoides gum	Handsome, fast-growing tree suitable for both granite and red soils	8/4 per 100	15/- per lb.
Eucalyptus calophylla	Calophylla gum	Small, ornamental gum with large white flowers	3d. each	..
Eucalyptus citriodora	Lemon-scented gum	A gum forming a clean bole and yielding a good timber; leaves lemon scented	8/4 per 100	15/- per lb.
Eucalyptus crebra	Narrow-leaved ironbark	Slow growing; stands drought and light frost; wood strong, hard and durable	8/4 per 100	...
Eucalyptus maculata	Spotted gum	Good timber tree; grows well in moist sub-tropical localities	8/4 per 100	..
Eucalyptus melliodora	Yellow box	Hardy against frost and drought	8/4 per 100	...
Eucalyptus microcorys	Tallowwood	First-class timber; suited to warm, damp districts	8/4 per 100	...
Eucalyptus paniculata	Grey ironbark	Valuable tree, producing a hard, durable timber	8/4 per 100	...
Eucalyptus pilularis	Blackbutt or flintwood	Quick-growing gum with hard, durable timber; susceptible to frost and drought	8/4 per 100	...
Eucalyptus punctata	Grey gum or leather jacket	Large tree, yielding good timber...	8/4 per 100	...
Eucalyptus resinifera	Forest mahogany	Valuable timber tree where frost is not severe	8/4 per 100	...

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Eucalyptus robusta ...	Swamp mahogany ...	Quick-growing, shady tree that requires moist soil to give the best results	8/4 per 100	...
Eucalyptus rostrata ...	Red gum	Produces valuable, durable wood; stands drought, heat, brak and a good deal of frost	8/4 per 100	15/- per lb.
Eucalyptus saligna ...	The Sydney blue gum ...	Lofty, straight-growing tree of the first importance; timber valuable for many purposes	8/4 per 100	15/- per lb.
Eucalyptus siderophloia ...	Broad leaved ironbark ...	Timber hard, durable and valuable; tender to frost and drought	8/4 per 100	...
Eucalyptus sideroxylon ...	Red ironbark	One of the best gums for dry, rocky and shallow soils; hardy against frost: excellent timber	8/4 per 100	...
Eucalyptus tereticornis ...	Forest red gum	Hardy tree, producing a valuable and durable timber very like that of Eucalyptus rostrata	8/4 per 100	15/- per lb.
Eucalyptus viminalis ...	Willow gum	Hardy and quick-growing tree in frosty localities; susceptible to drought	8/4 per 100	...
Grevillea robusta	Silky oak	Ornamental timber tree with fern-like leaves; yields handsome furniture wood	8/4 per 100	...
Lagunaria Pattersoni ...	Lagunaria	Evergreen tree; height, 40-50 feet, with bell-shaped, rosy-pink flowers	3d. each	...
Photinia japonica	Loquat	Hardy, evergreen tree ...	8/4 per 100 3d. each	...
Psidium pomiferum ...	Guava	Small, hardy tree bearing edible fruit	3d. each	.

Schinus molle	Pepper tree	Ornamental tree	8/4 per 100	...
Securidaca longipedunculata	Rhodesian violet tree	Small tree bearing numerous light violet-coloured and scented flowers	6d. each	...
Sterculia acerifolia	Flame tree	Handsome evergreen tree with brilliant crimson flowers	9d. each	...

DECIDUOUS TREES.

Cedrela toona	Indian toon tree	Quick-growing deciduous tree; ant resistant; produces valuable, soft, scented timber	8/4 per 100	15/- per lb.
Croton sylvaticus	...	Large-leaved deciduous tree from Melsetter	8/4 per 100	3d. per oz.
Dalbergia sissoo	The sissoo	Large deciduous tree suitable for planting along river banks and vleis; timber durable	3d. each	2/6 per lb.
Jacaranda mimosæfolia	Jacaranda	Ornamental deciduous tree with fern-like foliage and abundance of blue flowers	8/4 per 100	...
Liriodendron tulipiferum	Tulip tree	Deciduous tree with clean, straight bole and spreading crown	3d. each	...
Phytolaca dioica	Belhambra	Quick-growing deciduous tree; timber of no value	8/4 per 100	2/6 per lb.
Platanus orientalis	Plane tree	Ornamental deciduous tree	6d. each	...
Poinciana regia	Flamboyant	Ornamental deciduous tree with fern-like foliage and scarlet flowers	6d. each	...

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Populus alba	White poplar	Valuable tree, producing soft, white timber which is ant and borer resistant	1 ft. 10/- per 100; 3 ft. 25/- per 100; 5 ft. 50/- per 100	...
Salix babylonica	Weeping willow	Ornamental deciduous tree requiring damp situations	3d. each	...
Spathodea campanulata	...	Handsome, heavy-foliaged tree bearing bright red flowers	6d. each	...

ORNAMENTAL SHRUBS.

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Abutilon sp.	Chinese lantern	Shrub, height 8 feet; flowers orange coloured; requires heavy pruning about fourth year	6d. each	...
Abutilon sp.	Chinese lantern	Shrub with variegated foliage	6d. each	...
Acalypha sp.	Acalypha	Shrub with variegated foliage; not frost hardy	6d. each	...
Allamanda neriifolia	Allamanda	Compact, bushy shrub, 3-5 feet high; flowers golden yellow; fruits prickly	6d. each	...
Aloysia citriodora	Lemon scented verbena	Shrub, 4-6 feet high; foliage strongly lemon scented	6d. each	...
Bauhinia spp.	Bauhinia	Large shrubs, up to 25 feet, flowering profusely in early spring; white and mauve species	6d. each	1/- per oz

Bauhinia galpini ...	The Pride of De Kaap ...	Rambling shrub bearing orange-red flowers	6d. each	...
Brunfelsia uniflora ...	"Yesterday, to-day, and to-morrow"	Very free-flowering shrub; flowers sweetly scented—blue, changing gradually to nearly white; height 4 feet	1/6 each	...
Brunfelsia americana ...	... ...	Shrub with white flowers larger than those of Brunfelsia uniflora	9d. each	...
Buddleia sp.	Blue buddleia	Shrub up to 8 feet in height; flowers sweet scented; useful as a hedge	6d. each	...
Buddleia sp.	Yellow buddleia	Rank-growing shrub; height 12 feet; also useful as a hedge	6d. each	...
Callistemon speciosus ...	Bottle brush	Shrub bearing scarlet flowers; drooping habit; height 12 feet; useful as a hedge	6d. each	1/- per oz.
Cassia sp.	Cape laburnum	Quick-growing shrub bearing masses of bright yellow flowers	6d. each	1/- per oz.
Cestrum aurantiacum ...	Cestrum	Shrub, height 6 feet; flowers orange	6d. each	...
Cyphomandra betacea ...	Tree tomato	Shrub bearing edible fruit	6d each	...
Dahlia imperialis	Tree dahlia	Height 8 feet; makes a handsome show of single white blooms	6d. each	...
Deutzia crenata	Bridal wreath	Deciduous shrub; height 5 feet; flowers pure white	6d. each	...
Dombeya sp.	Rhodesian mallow ...	Shrub; height 10 feet; bears pink flowers in autumn	1/- each	...
Duranta plumieri	Tree forget-me-not ...	Indigenous shrub; height 10 feet; useful as a hedge; flowers blue; deciduous	6d. each	...
Euphorbia fulgens ...	... ...	Shrub; height 4 feet; handsome scarlet flowers	6d. each	...
Gardenia florida	Katjepeering	Compact, evergreen shrub, 4-8 feet high, with dark green, glossy leaves and pure white, sweetly-scented, double flowers	6d. each	...

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Genista sp.	Broom	Yellow-flowering shrub, 8 feet high	6d. each	1/- per oz.
Habrothamnos sp.	...	Hardy shrub bearing large bunches of trumpet-shaped red flowers; height 5 feet	6d. each	...
Heliotropium peruvianum	Heliotrope	Small shrub with sweet-scented lilac or nearly white flowers	6d. each	...
Hibiscus sinensis	Chinese rose	Evergreen shrub with numerous scarlet flowers: single and double varieties	6d. each	...
Hibiscus syriacus	Christmas rose	Shrub of which there are single and double, mauve and white varieties	6d. each	...
Holmskioldia sanguinea	Holmskioldia	Handsome, flowering shrub with yellow and red varieties	6d., each	...
Hypericum calycinum	St. John's wurt	Yellow-flowering shrub	6d. each	...
Iochroma tubulosa	Iochroma	Flowering shrub with dark blue, mauve and scarlet varieties	6d. each	...
Jasminum nudiflorum	Cape jasmine	Shrub with yellow flowers; height 10 feet	6d. each	...
Lagerstrœmia indica	Pride of India or crepe flower	Ornamental shrub; height 10-20 feet, with mauve, pink and white varieties	6d. each	...
Lantana hybrids	Lantana	Rank-growing shrub; height 8 feet; white, strongly-scented flowers; also useful as a hedge	6d. each	...
Michelia champaca	Michelia	Large, evergreen shrub with yellow, sweetly-scented flowers	3d. each	...
Nerium oleander	Oleander or Ceylon rose	Evergreen shrub; height 10 feet; red, double pink and white varieties	6d. each	...

Philadelphus grandiflorus	Mock orange or English syringa	Deciduous shrub with an abundance of white flowers	6d. each	...
Plumiera occulata	White frangipani	Shrub with white flowers	1/6 each	...
Plumiera rubra	Red frangipani	Shrub with pinkish-red flowers	1/6 each	...
Poinsettia pulcherrima	Poinsettia	Shrub with small, yellow flowers surrounded by many large, scarlet, leaf-like bracts	6d. each	...
Poinsettia albida	Poinsettia	Same as above with yellowish-white bracts	6d. each	...
Punica granatum	Pomegranate	Shrub having shining leaves and large, scarlet flowers; also makes a useful hedge	6d. each	...
Russelia juncea	Coral fuchsia	Shrub with tubular, coral-red flowers	6d. each	...
Salvia involucrata	Salvia	Free-flowering shrub with rose flowers	6d. each	...
Streptosolon jamesonii	...	Shrub with orange-coloured flowers	6d. each	...
Thevetia nerifolia	Thevetia	Evergreen shrub bearing yellow flowers	6d. each	...
Tebushina sp. (syn. Lasiandra)	...	Shrub, 6·10 feet high, with rich violet-purple flowers	1/- each	...
Tecoma Smithii	...	Shrub up to 10 feet high, with bright yellow flowers	6d. each	...

CLIMBERS AND CREEPERS.

Antigonon leptopus	Antigonon	Vigorous, pink-flowering creeper with dark foliage	1/- each	...
Aristolochia sipho	Dutchman's pipe	Rank-growing creeper	6d. each	1/- per oz.

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Beaumontia grandiflora	Beaumontia	Large climber with heavy, glossy foliage: large, white, bell-shaped flowers; blooms profusely	1/- each	2/- per oz.
Bignonia venusta	Golden shower	Vigorous creeper; quick growing; bears masses of flowers all the year round	9d. each	...
Bougainvillea glabra	Bougainvillea	Vigorous climber; may also be used as a hedge; bracts magenta	9d. each	...
Cereus grandiflorus	Queen of the Night	Climbing cactus; suitable for climbing up native trees; bears large, sweet-scented flowers opening at night	6d. each	...
Clitoria ternatea	Mussel-shell creeper	Slender creeper bearing pretty, porcelain-blue flowers	6d. each	...
Hedera helix	Ivy	Dark, evergreen climber	6d. each	...
Jasminum grandiflorum	Climbing jasmine	Hardy climber with sweet-scented white flowers	6d. each	...
Jasminum sambac	...	Vigorous, evergreen shrub-climber with large trusses of fragrant white flowers	6d. each	...
Lonicera periclymenum	Common honeysuckle or woodbine	Hardy climber with white, sweet-scented flowers	6d. each	...
Lonicera sempervirens	Red honeysuckle	Climber with red flowers	6d. each	...
Mandevilla suaveoleus	Mandevilla	Deciduous climber bearing trumpet-shaped, white, fragrant flowers	6d. each	...
Passiflora edulis	Granadilla	Quick-growing climber bearing edible fruits	3d. each	...

Passiflora s	Fiji granadilla	Large-leaved climber bearing yellow fruit	6d. each	...
Podranea Brycei	Zimbabwe creeper ...	Rank-growing indigenous creeper with large, pink flowers	6d. each	...
Rosa bracteata	MacCartney rose ...	Plant with dark green foliage and numerous white, single flowers; useful as a hedge plant	3d. each	...
Solanum wenlandii ...	Potato creeper	Quick-growing creeper with blue flowers	6d. each	...
Wistaria sinensis	Wistaria	Slow-growing climber bearing trusses of lilac flowers	6d. each	...

HEDGE PLANTS.

Cratægus pyracantha ...	Hawthorn	Evergreen shrub; makes a strong, thorny hedge	9d. each	...
Duranta plumieri	Tree forget-me-not ...	Indigenous shrub; makes a useful hedge	6d. each	...
Ligustrum lucidum ...	Chinese privet	Useful hedge plant	8/4 per 100	...
Murraya exotica	Murraya	Compact, evergreen shrub with small, sweet-scented, white flowers; makes very good hedge	1/- each	...
Paliurus aculeata	Christ thorn	Small, thorny shrub with bright scarlet flowers: suitable for borders	6d. each	...
Parkinsonia aculeata ...	Jerusalem thorn	Thorny, evergreen hedge plant with bright yellow flowers	3d. each	...
Pittosporum undulatum ...	Camphor laurel	Evergreen shrub making an excellent hedge	3d. each	...

Botanical Name.	Common Name.	Remarks.	Price of Transplants.	Price of Seed.
Plumbago capensis	Plumbago	Shrub with blue flowers	6d. each	...
Rhus lancea	"Karee"	Indigenous shrub ; makes a good hedge	8/4 per 100	...
Spirea prunifolia	Cape may	White-flowering shrub	6d. each	...
Tecomaria capensis	Kaffir honeysuckle	Hardy shrub bearing orange-red flowers	6d. each	...
Thuya orientalis	Thuya	Small, evergreen tree ; makes a good hedge	8/4 per 100	...

Besides the plants specially mentioned as suitable for hedges, there are many others. For use as a hedge a tree or shrub must have dense foliage and bear frequent cutting without serious injury.

The First Egg-Laying Test in Rhodesia.

21st APRIL, 1920, to 2nd MARCH, 1921.

REPORT FOR WEEK ENDING 16th NOVEMBER.

By A. Little, Poultry Expert.

Ninety-two birds were laying during the week and produced 472 eggs, an average per laying bird of 5.13, or for the 98 now taking part an average of 4.81. There were 328 eggs weighing each 2 ozs. and over, and 144 under 2 ozs. The total weight of eggs laid during the week was 64 lbs. 6 4-16 ozs., 42 lbs. 15 2-16 ozs. weight of eggs each 2 ozs. and over, and 21 lbs. 7 2-16 ozs. of eggs under 2 ozs. The maximum number of eggs laid on one day was 75, on the 13th; the minimum, 62, on the 15th. The average number per day was 67.42.

Pen 4 laid 29 eggs during the week.
Pens 5 and 18 each laid 28 eggs during the week.
Pens 1, 11 and 13 each laid 27 eggs during the week.
Pens 3 and 19 each laid 26 eggs during the week.
Pen 8 laid 25 eggs during the week.
Pens 10 and 15 each laid 24 eggs during the week.
Pens 6, 12, 16 and 20 each laid 23 eggs during the week.
Pen 7 laid 22 eggs during the week.
Pen 2 laid 21 eggs during the week.

Five birds each laid 7 eggs during the week.
Thirty birds each laid 6 eggs during the week.
Twenty-eight birds each laid 5 eggs during the week.
Ten birds each laid 4 eggs during the week.

Hen No. 8 (pen 2) was returned to her pen, cured of broodiness, on the 13th. Hens Nos. 43 (pen 9), 47 (pen 10) and 79 (pen 16) were placed in the broody coop on the 14th. Hen No. 69 (pen 14) was taken out of her pen, suffering from a slight attack of diarrhœa, on the 11th, cured on the 12th and laid on the 13th. All the birds are in excellent health. There was rain at 4 a.m. on the 11th, on the 13th from 11 a.m., and throughout the afternoon rain fell. The birds were shut in their houses before it commenced and did not get wet; had they done so, and gone to roost wet, the number of eggs would have dropped considerably.

Hints to Breeders.—At the risk of labouring the point I again urge the keeping of the birds dry and scratching in the litter on the floors of their houses during the wet weather in order to keep up the supply of eggs; if this is not done, the supply will drop rapidly.

I have recently heard of a number of losses of fowls, chickens and turkeys by wild cats, snakes and other vermin. The remedy is in the hands of the poultry keepers themselves, who should be continually waging war on such vermin. I would suggest too that natives should be given a small sum, say 3d. or 6d., for every wild cat, snake or other species of vermin brought in dead. I hope shortly to publish a few notes on the methods that should be adopted to eradicate these.

Those competitors in this test who have become members of the National Utility Poultry Society, and will thus participate in the prizes to be awarded by this society for this test (viz., 1st £5; 2nd £3; 3rd £2), are reminded that the annual subscriptions of 10s. 6d., from 1st October, 1920, to 30th September, 1921, are now due, and should be forwarded to H. N. Wheeldon, Hon. Secretary, The National Utility Poultry Society of South Africa, P.O. Box 7125, Johannesburg. Papers relating to this society can be obtained on application to the above or to the Poultry Expert, Department of Agriculture, Salisbury.

Applications should now be made to the Poultry Expert by those wishing to enter pens in the second Rhodesian Egg Laying Test, commencing 1st April, 1921.

Summary.—There are now 98 birds on the test, two having died, which their owners have not replaced. One of these, No. 44 (pen 9), had not been laying for some time, although apparently quite healthy in every way and taking her food well; she suddenly became paralysed and died on the next day. *Post-mortem* shewed a large number of small grape-like bodies of a faint pinkish colour, covering all the organs in the abdomen, which on microscopic examination were similar to cancer tissue. Hen No. 82 (pen 17) died of ruptured ovum.

The test still continues to create a large amount of interest in Rhodesia and the Union, not only by poultry keepers, but also by those who do not keep fowls. It is to be hoped that it will be the means of inducing the latter to do so, for the more profitable poultry there are, the better it is for the food supply and revenue of Rhodesia.

Egg Laying Test. Salisbury.

THE FIRST SOUTHERN RHODESIA EGG-LAYING TEST.

21ST APRIL, 1920, TO 2ND MARCH, 1921.—FIVE BIRDS IN EACH PEN.

Pen.	Position to date.	Owner.	Residence.	Breed.	21st April to 16th November, inclusive (30 weeks).			
					Total No. of eggs.		Total weight of eggs.	
					Above 2 ozs.	Below 2 ozs.	Above 2 ozs.	Below 2 ozs.
1	4	H. Tatham	Penhalonga	White Leghorns	675	119	89 lbs. $1\frac{4}{16}$ oz.	13 lbs. $4\frac{8}{16}$ ozs.
2	12	Mrs. Walleen	Bembesi	do.	514	129	66 lbs. $14\frac{12}{16}$ ozs.	14 lbs. $9\frac{4}{16}$ ozs.
3	3	A. Hampson	Salisbury	do.	667	47	89 lbs. $7\frac{5}{16}$ ozs.	5 lbs. $8\frac{11}{16}$ ozs.
4	14	Mrs. Renton	Que Que	do.	477	68	64 lbs. $9\frac{1}{16}$ ozs.	7 lbs. $11\frac{13}{16}$ ozs.
5	11	A. R. Low	Gwelo	do.	513	161	67 lbs. $2\frac{2}{16}$ ozs.	18 lbs. $8\frac{7}{16}$ ozs.
6	16	W. Bands	Salisbury	Anconas	489	104	62 lbs. $14\frac{14}{16}$ ozs.	11 lbs. $14\frac{4}{16}$ ozs.
7	13	Mrs. Lloyd	Inyazura	White Leghorns	478	12	66 lbs. $9\frac{7}{16}$ ozs.	1 lb. $6\frac{4}{16}$ ozs.
8	19	W. F. Williams	Selukwe	do.	398	244	49 lbs. $15\frac{13}{16}$ ozs.	27 lbs. $10\frac{2}{16}$ ozs.
9	20	Mrs. Kimpton	Umtali	do.	342	165	43 lbs. $11\frac{13}{16}$ ozs.	17 lbs. $10\frac{2}{16}$ ozs.
10	2	Mrs. Gibbings	Avondale	do.	673	27	93 lbs. $9\frac{1}{16}$ ozs.	3 lbs. $2\frac{3}{16}$ ozs.
11	15	H. Fretwell	do.	Rhode Island Reds	484	102	63 lbs. $12\frac{7}{16}$ ozs.	11 lbs. $9\frac{15}{16}$ ozs.
12	5	T. Brokensha	Umtali	White Leghorns	632	33	86 lbs. $8\frac{9}{16}$ ozs.	8 lbs. $14\frac{2}{16}$ ozs.
13	1	C. L. Brown	Salisbury	do.	711	13	94 lbs. $7\frac{8}{16}$ ozs.	1 lb. $8\frac{2}{16}$ ozs.
14	10	J. S. Wreford	Bulawayo	do.	511	5	72 lbs. $9\frac{5}{16}$ ozs.	$9\frac{7}{16}$ ozs.
15	9	D. O'Linn	Salisbury	do.	578	91	74 lbs. $15\frac{15}{16}$ ozs.	11 lbs. $7\frac{9}{16}$ ozs.
16	7	A. E. Speight	do.	do.	611	159	80 lbs. $0\frac{3}{16}$ oz.	18 lbs. $8\frac{7}{16}$ ozs.
17	18	Mrs. Williamson	Banket	do.	405	119	51 lbs. $8\frac{8}{16}$ ozs.	13 lbs. $10\frac{3}{16}$ ozs.
18	8	Bray & Bull	Umtali	do.	599	134	77 lbs. $5\frac{14}{16}$ ozs.	15 lbs. $6\frac{13}{16}$ ozs.
19	6	Miss Greig	Bulawayo	do.	631	36	85 lbs. $11\frac{10}{16}$ ozs.	4 lbs. $2\frac{7}{16}$ ozs.
20	17	Mrs. Deall	Old Umtali	do.	470	330	57 lbs. $7\frac{3}{16}$ ozs.	36 lbs. $15\frac{14}{16}$ ozs.
				Totals	10,858	2,098	1,438 lbs. $6\frac{10}{16}$ ozs.	244 lbs. $2\frac{9}{16}$ ozs.

Annual Conference of the South African Poultry Association.

This conference, which has met now in different large towns in the Union for the last sixteen years, was held for the first time in Rhodesia at Bulawayo on 9th November and following days. Delegates from different poultry clubs in the Union and Southern Rhodesia were present to the number of 48, and Mr. Gianovetti, M.L.A., ex-Mayor of Pretoria, presided. The conference was opened by H.H. the Acting Administrator, who made a special journey from Salisbury for the purpose. The Mayor of Bulawayo welcomed the delegates on behalf of the town; a delegate from each province of the Union suitably responding. Dr. E. A. Nobbs, Director of Agriculture, was unable to be present at the opening ceremony, but attended several of the subsequent sessions.

There were 104 resolutions on the agenda, the majority of which dealt with the utility and commercial aspects of the poultry industry. Among these was one dealing with special demonstration trains for poultry and agricultural subjects, and a sub-committee to deal with this matter was formed, consisting of Dr. Eric Nobbs, Mr. A. Little and Mr. Greig, representing Southern Rhodesia, and Mr. Bourlay, the Union Government Poultry Expert, and Mr. Oettle, representing the Union. This sub-committee submitted the following recommendations:—(a) That the Governments of the Union and Southern Rhodesia be urged to provide funds on their next estimates for educational propaganda regarding the production and consumption of poultry products, particularly by means of railway vehicles and motor cars equipped with exhibits, literature, film and lantern apparatus, to tour rural districts and centres in charge of competent lecturers, who will address meetings on the management and general treatment of poultry, the treatment and prevention of diseases, pests and vermin, the sale and distribution of products (including co-operation, formation of egg circles, etc.), and the organisation of poultry clubs for adults, boys and girls; (b) that the above portion of the resolution be referred to the Agricultural Societies and Unions and that their co-operation in the matter be invited; (c) that the conference deputes delegates to wait upon the Cost of Living Commission now sitting in Bulawayo in order to urge the importance of the poultry industry as a factor in reducing the high cost of living.

These and many other important resolutions, dealing with the marking, grading and sale of eggs, handling of eggs in transit, thefts of poultry, etc., were carried unanimously. A utility standard for all breeds of fowls was presented and carried, also unanimously.

The conference closed on Friday evening, and a banquet was held at the Carlton Hotel on the evening of the 10th. On the afternoon of the 11th the delegates and their friends visited the Matopos in cars kindly lent by citizens of Bulawayo. Full particulars of this conference will appear in the next issue of the *Agricultural Journal.*

Veterinary Report.

August, 1920.

AFRICAN COAST FEVER.

Gwelo District.—No fresh cases occurred during the month.

Mazoe District.—Nil.

Melsetter District.—Nine deaths from African Coast Fever occurred at Tarka during the month.

Matobo District.—Seven cases occurred; one case occurred on Sauerdale (Usher No. 1).

QUARTER-EVIL.

The following deaths are recorded at the different centres:—Bulawayo, 207; Victoria, 123; Salisbury, numerous; Umtali, 64; Melsetter, 32.

CONTAGIOUS ABORTION.

Several cases reported from Marandellas, Bromley and Umtali.

HORSE-SICKNESS.

The following number of deaths are recorded:—Mrewa district, 1; Victoria district, 4.

TUBERCULOSIS.

Five head slaughter cattle exported to the Pietermaritzburg abattoirs were found to be suffering from tuberculosis on slaughter.

TRYPANOSOMIASIS.

Cases still occurring on Cartleigh Farm, Melsetter district.

IMPORTATIONS.

From the United Kingdom:—Heifers, 3; bulls, 4. From the Union of South Africa:—Heifers, 39; bulls, 49; horses, 210; mules, 103; donkeys, 111; sheep and goats, 90; pigs, 20.

EXPORTATIONS.

To the Union of South Africa:—Breeding cattle, 1,563; slaughter cattle *via* Bulawayo and Plumtree, 815; *via* Liebig's Drift, 2,527; pigs, 32. To Northern Rhodesia:—Horses, 2; donkey, 1; goats, 35; sheep, 40. To the Belgian Congo:—Horses, 6; mules, 6; goats, 30;

pigs, 16; sheep, 100. To Beira during July:—Horse, 1; mule, 1; breeding cattle, 15; slaughter oxen, 205; during August: sheep, 50 horses, 2; mule, 1; slaughter oxen, 70; breeding stock, 4.

September, 1920.

AFRICAN COAST FEVER.

Gwelo District.—No fresh cases occurred during the month.

Mazoe.—Nil.

Melsetter District.—Nil.

Matobo District.—Mortality at this centre still continues. During the month 25 deaths were reported and two head were destroyed on Sauerdale.

QUARTER-EVIL.

The following number of deaths are recorded at the different centres:—Bulawayo, 71; Gwelo, dormant; Victoria, 42; Umtali, 11; Melsetter, 30.

CONTAGIOUS ABORTION.

Several outbreaks occurred in Umtali, Makoni, Salisbury, Bromley and Marandellas districts.

HORSE-SICKNESS.

One case reported at West Nicholson and one at Victoria.

TUBERCULOSIS.

During the month a portion of a herd of cattle were subjected to the sub-cutaneous and ophthalmic tests, with several suspicious re-actions. Four of the most pronounced re-actors were destroyed. *Post-mortem* examinations revealed existence of tubercular lesions. Specimens sent to the Government Veterinary Bacteriologist were confirmatory. Arrangements have been made for the isolation of suspects and testing of remainder of the herd.

TRYPANOSOMIASIS.

Nineteen head of cattle are reported to have died from this disease on the Gwaai (Nyamandhlovu district).

SENKOBO (SKIN DISEASE).

Nine cases reported from Nyamandhlovu.

POISONING.

Cases are constantly being reported from the different centres of deaths amongst stock, due, in many cases, to the careless handling of dip; vegetable poisoning is also reported to be taking its toll.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 133; heifers, 90; horses, 95; mules, 102; donkeys, 255; sheep, 983; goats, 245.

EXPORTATIONS.

To the Union of South Africa:—Breeding cows and calves *via* Liebig's Drift, 353; slaughter oxen *via* Bulawayo and Plumtree, 1,727; mules, 4; goats, 40; pigs, 18. To Northern Rhodesia:—Horses, 2; pig, 1. To the Belgian Congo:—Donkeys, 18; sheep, 130. To Portuguese East Africa:—Horses, 9; mule 1; breeding cattle, 91; sheep and goats, 141; slaughter cattle, 302.

C. R. EDMONDS,
Acting Chief Veterinary Surgeon.

Witwatersrand Maize and Fat Stock Show.

We have recently received from the Secretary of the Witwatersrand Agricultural Society the schedule shewing by districts the number of points awarded to each in the district cup competition on the September maize show. The delay in publishing this record has been due to difficulty in ascertaining exhibitors' correct districts. In the final results the first four places are as follows:—

District.	Points.
1. Potchefstroom	217
2. Ladysmith	204
3. Mazoe	152
4. Salisbury	77

Out of a total of 933 points Southern Rhodesia gained 253, and was third by provinces, the Transvaal securing 378 points and Natal 264 points. Of the Rhodesian total other districts contributing were Lomagundi 12 points, Umtali 10 points and Rusape 5 points.

When it is remembered that this Territory only exhibited two breeds, namely, Hickory King and Salisbury White, and was not therefore competing in the yellow classes at all, for which the Union entries were very numerous, the Rhodesian breeders' successes are the more praiseworthy.

The Agricultural Outlook.

The rains this season have been very late and very patchy; consequently planting has been delayed. This has given farmers an excellent opportunity of getting their lands well prepared and also of destroying weeds by harrowing. In certain districts, however, insufficient rain has fallen to permit of ploughing being done, and some anxiety is felt at the season's prospects. This is yet another illustration of the advisability of ploughing as much land as possible immediately crops have been reaped. Good rains have fallen in the Makwiro district, and a considerable amount of planting has been done. There are about 100.000 bags of maize still to be exported, and in this respect the lateness of the rains is fortunate, for there is a quantity of grain lying out in the open without protection. Reports indicate that a very considerable acreage of side crops, chief among which are velvet beans and ground nuts, will be planted this year, and it is evident that the value of velvet beans as a rotation crop and soil renovator is being recognised to a greater extent.

The planting of tobacco has not been very extensive owing to the lack of general rains. The indications are, however, that, given suitable climatic conditions, the acreage under this crop will be considerably greater than it was last year. We would again warn growers to pay more attention to quality than to quantity, for it is possible that inferior leaf will be unsaleable. There are bulletins available, free of charge, at the Department of Agriculture dealing with every operation of tobacco growing, while a handbook of tobacco culture can be obtained for the sum of 2s. 6d., and we would advise growers who are taking up tobacco growing for the first time to procure this literature. There is a calendar of farming operations produced with each issue of the *Journal*, giving expert advice on practically all subjects connected with farming in this country, and a perusal of this will, we think, be of benefit to those not familiar with local conditions.

Cattle have, generally, wintered well, and there have been few deaths from poverty. The veld is, however, badly in need of rain, and the grass at present has little nutriment in it. The position in regard to disease may be considered satisfactory, and with the exception of the Matopos area, there has not been a case of East Coast Fever since August at the other centres of infection. Quarter-evil for the time being is less in evidence, but it is as well to remind stockowners that the immunity conveyed by inoculation only holds good for a period of twelve months. The establishment by the B.S.A. Company, as recently announced, of a tannery in Salisbury is a welcome addition to our growing list of local industries, and will be of benefit to stockowners.

As a result of the success Mr. Bevan has had with his horse-sickness virus, a number of fillies for breeding purposes have been brought into the country. The experiments will be followed with much interest.

The demand for trees and shrubs is increasing, and we would refer those interested to the list appearing in this issue of the *Journal.*

Nature Study.

With the wide and untraversed field offered, with the obvious need of rendering rural life attractive, and with the large number of children growing up whose lives must be passed remote from towns, it is deplorable that so little has been taught, or indeed so little has been learned by those who can teach the rising generation in Rhodesia regarding the mysteries embraced under the general term nature study. We therefore welcome, as a pioneer effort, a booklet issued by the girls of the Eveline High School, Bulawayo, under the guidance of Miss E. Mitchell, and with a foreword by Mr. L. M. Foggin, the Director of Education. The effort, and more especially the underlying motive, deserve credit as an attempt to make and record observations and arouse early a spirit of enquiry in regard to plants and animals and the things of nature around us.

Some twenty-four indigenous trees, a few weeds, and some species of antelope are described, or rather mentioned, with a few notes regarding each. It is intended that this shall form the nucleus of a more ambitious treatise in the future. This being so, it may be permissible to emphasise the need of the well-intentioned child contributors making sure of their facts before committing them to imperishable form on paper, where they will be read and accepted as authoritative and correct by many who cannot confirm them by personal observations.

This little book contains a number of inaccuracies and incompletenesses which might have been obviated by fuller enquiry instead of apparent acceptance of uncorroborated statements.

By nature study the true scientific principles of caution, conscientious accuracy and painstaking precision are to be inculcated, as well as the mere joy of the collector lust and rambles.

A book of nature study for Rhodesia is certainly required in our schools, and as such this preliminary effort is welcomed. The need, however, is emphasised of the great importance of exactitude, even in mere popular and rudimentary science, for children whose impression-able minds will retain vividly the first statements conveyed to them and unquestionably accept as beliefs ideas which if not true it may later be the more difficult for them to discard. For these reasons it is doubly important to check and verify all such information. Such a nature study book might well give a brief account of our seasons and climate, and deal with our dominant vegetation—trees, shrubs and grasses. Besides buck, other wild animals, birds and insect life might be studied, and an interesting chapter devoted to rocks and minerals. Special attention should be given to correct nomenclature, and to clear if simply worded descriptions enabling natural objects to be recognised from the pages of the textbook, which would thus become invaluable for reference. We hope this little book may be the forerunner of a much fuller treatise on the subject.

Correspondence.

DEVON CATTLE.

To the Editor,
The Rhodesia Agricultural Journal,
Salisbury.

Sir,—Your August number contains a letter from Mr. Dalton of Gatooma, in which he takes issue with a statement attributed to me in your report of the Devon Cattle Breeders' meeting, contained in the June number of the *Journal*. I thank Mr. Dalton for calling my attention to that report, as I had not previously seen it, or I would have corrected it earlier.

The remark to which he objects is, "That after many years' experience he was of opinion that the Devon not only held its own, but matured a year earlier than heavier breeds."

Unfortunately I have the lazy man's bad habit of making no notes on matters which I intend to discuss at meetings, so that I have nothing to which I can now refer to refresh my memory. I am, however, morally certain that I did not use the expression attributed to me, for the reason that *I have never thought such a thing.* Before the meeting I had received a letter from a well-known Australian rancher who runs three breeds of cattle on his ranch—Devons and two of the heavier beef breeds. He wrote to say that he was finding under his conditions that Devon steers matured and came fat for the butcher on grass a year earlier than those of the two heavier breeds. That he now sold the former as three-year-olds, while those of the heavier breeds he had to keep a year longer. These latter were heavier as four-year-olds than the Devons at three years, but the Devons paid him better, as he was fully stocked.

Having this in mind, what I may have said and probably did say at the meeting was to the effect that, in my opinion, experience here might shew that the smaller breeds may mature a year earlier than the heavier breeds under average Rhodesian conditions. (As in the case stated above.) I have never felt that our experience has been long enough to demonstrate breed superiority in this country. We are still too near the native and Africander in our grading operations. Up to the present nothing more has been shewn than that on particular farms, and under a particular management, a change of breed has often been in the best interests of the owner.

I am sorry that such remarks as I made at the Devon Breeders' meeting should have been construed into a sweeping statement derogatory to other breeds. Mr. Dalton has made excellent capital out of it, and I am sure the Shorthorn breed has not suffered. I trust the champions of other breeds will let me off after reading my explanation.

I would like to point out to Mr. Dalton that he is in error when he argues, as he does in his letter, that "early maturity" and scale or size are synonymous terms when applied to cattle. "Maturity" is the quality of ripeness, or of full growth, or of the completion of a period of preparation for use. "Early maturity" is a technical term applied to modern farm live stock, meaning that they are ready for the use for which they are bred much quicker and at younger age than the live stock of, say, 50 years ago. Food available for these animals has been the determining factor with breeders. In parts of Great Britain, United States, and in the lucerne areas of South Africa, the aim of the breeder is to produce cattle which will come ripe or ready for the butcher during their third year (two or three years old). Shorthorns, Angus, Herefords, Sussex and Devons have this quality fixed in them. In the Highlands of Scotland the breeders are content to get maturity at four to five years out of their Highland or Galloway cattle; nor do they, in spite of the great Smithfield triumphs of Angus and Shorthorns, introduce those breeds there, without preparing a large amount of feed to supplement the grazing.

The cattle of the Devon breed are known to be smaller when "mature" than those of the heavier breeds, but the two-year-old Devon at Smithfield is just as "mature" and as ripe for the butcher as the heavier Shorthorn. By reason of their greater natural scale, the heavier breeds eat more food, *when it is available*, and come to greater weights than the Devon. It is not denied by anyone that the Devon makes equal weight in proportion to food consumed with the heavier breeds.

Amongst specialised dairy cattle, "early maturity" is measured by the age at which they are sufficiently developed to calve and produce milk. In this respect the Jersey is the most "early maturing" of cattle, being usually bred to calve at about two years or even younger. In size she is perhaps only half as heavy as a Shorthorn heifer of the same age, which matures from a breeding standpoint a year later.

"Early maturity" at Smithfield and other fat stock shows is the first consideration only in so far as the animal must come up to what may be called the standard weight for age of the breed. This I believe is for two-year-olds about 1,800 lbs. live weight for Shorthorn, Angus, Sussex and Hereford; and 1,600 for Devons.

In ranching countries "early maturity" means about four to five years, unless the cattle are sent to the feed lots in the grain belts. I am told that Angoni cattle mature at about twelve years old, and Southern Rhodesia native cattle at from eight to ten. With these as foundation stock it remains to be seen what our grades will do. Under conditions of best grading, or of full feed, they will, if highly graded, perhaps "mature" at from three to four. Under average ranching conditions the ripe age is still problematical. Will the lighter breeds "ripen" earlier than the heavier ones? I do not know. A long experience is needed yet, and even then the evidence will be conclusive as to the particular farm and management only (as in the Australian case cited above); and out of these individual cases the breed partisans must draw conclusions of a general nature. There will no doubt be found conditions which suit each breed, but whether popularity as evidenced by numbers will be in the English order remains to be seen.—Yours, etc.,

St. C. B. Gwynn.

Farming Calendar.

December.

BEE-KEEPING.

Honey in good quantities will still be coming in, as the welcome rains will be beneficial to veld blooms. Continue to give room by extracting honey from shallow frames, then return these to be refilled. Extracted honey should be drawn from the machine into the honey ripener, into which it should be strained through several thicknesses of butter muslin, remaining there, to allow surplus water to evaporate, for five days, then draw off from the tap into clear white glass bottles. All bottles must be cleansed thoroughly. See that ventilation is ample on hot days.

CITRUS FRUITS.

Citrus trees can be planted out at any time between October and the end of January. The best time is the end of October or early November, when the ground is warm and trees have hardened up their first growth of season, *i.e.*, spring growth, and are in fit condition to commence second growth, which they will do if transplanted properly at that time—end of October. Citrus trees should not be planted later than the end of January, as the growth they put on after planting later than this is very liable to be still sappy at the approach of winter, and consequently more sensible to the effect of cold. The young trees require to be well watered after planting. The soil around them should never be allowed to be really dry, but, on the other hand, it must not be kept in a state of sogginess. Immediately after planting protect the stems of the young trees from the sun by whitewashing or covering up with grass. Cut the tree down so as to leave a stem of about 2 ft. 6 ins. or 3 ft. long, and form the head of the future tree in the top 8 ins. or 1 ft., according to the best position of the shoots, not more than three or four in number. All other growths to be suppressed whenever they appear. Keep the soil nice and loose by digging, forking or hoeing round the young trees. It will then not be necessary to water them so frequently. The orchard should by this time have been thoroughly ploughed, and any cover crop sown already be up and growing. Don't forget, before the wet season, the first ploughing should be up and down the steepest gradient of the orchard, and be followed immediately after harrowing by cross-ploughing across the hill. This is to obviate as much as possible erosion of the soil during the coming heavy rains. Remember that, if a long spell of dry weather occurs during the so-called wet season, your bearing orange trees will probably require an application of water, otherwise the crop of fruit may receive a check from which it will never properly recover.

CROPS.

This is the busiest planting month of the farm year, during which most crops should be sown. Main crop maize planting is usually commenced in November and continued through December, but should be finished if possible at latest by Christmas. Light harrowing with the Hallick weeder or light tooth harrow soon after germination of the maize and until the plants are 6 to 10 inches high is beneficial, most in keeping down weeds and maintaining a soil mulch. This harrowing is better done during the heat of the day, when plants are less liable to break off. Other crops which will be sown during the month are ground nuts, velvet beans, sunflower, cowpeas, pumpkins, mangold, majorda melons, linseed, hibiscus and Sunn hemp for fibre or seed.

DAIRYING.

The hot weather having now begun, farmers will find it very difficult to keep their dairy produce in good condition. Especially does this apply to cream producers, who have in many cases long distances to send their cream before it reaches a factory. Cream must be cooled down immediately it comes from the separator; this is of the utmost importance. Allow the fresh cream to remain by itself until the next separation takes place before mixing it with an older cream. The longer you can keep apart any two creams of different ages, the better and the longer will the cream remain sweet. Keep cream cans cool by the application of wet sacks, etc.

ENTOMOLOGICAL.

Maize.—Plant during first half of this month to avoid stalk borers. See "Maize Stalk Borer," *Agricultural Journal,* December, 1917. Distribute poisoned bait shortly before or immediately after planting on red soils to destroy various pests, including surface beetles, snout beetles, etc., which may affect the stand. See "Maize on Red Soils," *Agricultural Journal,* April, 1919. Cutworms and Maize Beetle (*Heteronychus*) may be in evidence. See "Cutworms," *Agricultural Journal,* August, 1918, and the "Maize Beetle," *Agricultural Journal,* February, 1918.

Tobacco.—The newly planted crop is subject to the attack of cutworms, surface beetles, stem borers, leaf miners, "wireworms," grasshoppers, large crickets, etc. A good deal of protection may be obtained by dipping the tops of the transplants as far as the roots in arsenate of lead 1 lb. to 15 gallons of water. See *Agricultural Journal,* December, 1919, and February, 1920.

Potato.—Ladybirds may be injurious to the foliage. See "Two Ladybirds injurious to Potato Plants," *Agricultural Journal,* October, 1913. On sandy soils blue blister beetles may be troublesome. An immediate spraying with arsenate of lead 1 lb. to 12 gallons water should give relief.

Cabbage, Turnip, etc.—Webworm and diamond back moths are still the main pests. See "Cabbage Webworm," *Agricultural Journal*, February, 1914. Dusting with Paris green and lime should give protection against both pests.

Bean.—Stem maggot may be serious in December, especially if previous crops have been grown for French beans in gardens. See "Bean Stem Maggot," *Agricultural Journal*, April, 1913.

Melon, Marrow, etc.—Leaf-eating beetles frequently destroy the very small plants entirely. Spray with an arsenical and sugar wash or dust with Paris green 1 lb., lime 20 lbs.

Deciduous Trees.—Chafer beetles, fruit beetles are commonly very troublesome. See "Chafer Beetles," *Agricultural Journal*, December, 1914.

Fig.—Collect and destroy all fruit infested with fig weevil, and any wild figs near to the orchard.

Mosquitoes, House Flies, Stable Flies.—Destroy all breeding places round homestead. Poison or trap adults. See *Agricultural Journal*, June, 1915, and December, 1916.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

FORESTRY.

Give the ground the final harrowing, and if the season is a normal one, planting out should commence. This is the ideal month for planting out in a normal season, as the young trees have the benefit of all the summer rains, and become well established before the dry winter months arrive. Plant on dull, rainy days, or failing such days, late in the afternoons.

POULTRY.

During this month some of the birds will be commencing to moult, at which time they are more inclined to put on fat. In such a condition the period of moulting is lengthened, the birds, in poultry parlance, "hang in the moult," and so eggs are not forthcoming. To induce the birds to get through the moult quickly and come on to lay again (some will even lay through it) the following treatment is recommended:—Keep them in good hard lean condition, and give food suitable for the growth of feathers, such as sunflower seed, linseed (either plain or stewed with a little water), additional meat, insects, thick separated milk, or as an alternative meat meal or fish meal, a little flowers of sulphur in the dry mash, and such green foods as cabbage and cauliflower leaves. Do not try to force the moult, as is sometimes recommended; it is uncertain and can only be accomplished successfully by using care, and in the hands of an experienced breeder. Keep the birds dry during the wet weather, and many more eggs and healthier birds will be the result. See too that the young stock are not allowed to go to roost wet, otherwise colds and bronchitis will be the result. Above all see the young turkeys are not allowed to become wet; hatching of these should have concluded some time ago, and should not be recommenced until the wet season is well over. A little wet weather will not hurt young ducklings, but they also must sleep dry. See that the houses are waterproof; a wet house means less eggs and sick, unprofitable birds.

STOCK.

Cattle.—The veld in most districts is now good, and little trouble in respect of grazing is likely to be experienced. Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on freshly prepared soil. Transplanting should be pushed as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertilisers to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

VETERINARY.

Occasional cases of horsesickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gallsickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland usually six inches of rain fall this month, and in Matabeleland five inches, but considerable variations occur. Less rain usually falls at this time in extreme southern parts of the country. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight or may extend to six weeks; in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe, to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

January.

BEE-KEEPING.

Where it is desirous, artificial swarms can now be made, so also can nuclei be formed from proved best working strains. All the above must be stimulated with food. In the cooler districts it will be necessary to contract the entrances and close down for winter.

CITRUS FRUITS.

(See under December notes.)

CROPS.

Sowings of maize and beans for ensilage and Sunn hemp or beans for green manuring may be continued up to the middle of the month. Hay crops such as teff grass, manna, Sudan grass and summer oats should go in during the first week of this month. Napier fodder, Kikuyu and other grasses may be planted out, and catch crops of teff and buckwheat can be put in up to the end of the month.

DAIRYING.

The summer now being far advanced, attention should be given to the percentage of fat in cream, as the cream should contain a higher percentage in the summer than in the winter. Adjust the cream screw of your separator so that you obtain cream testing from 40 to 50 per cent. butter fat. The reason for this is that a heavy-bodied cream carries better than one testing only 30 per cent., and will remain sweeter during a long journey. Most separators are adjusted to skim cream testing about 45 per cent. butter fat, and if an excessively high testing cream is produced, the efficiency of the separator will be impaired and a loss will be sustained in the separated milk. So do not attempt to separate cream of a higher test than 50 per cent. Cheese making is now in full swing, and it should be remembered that good cheese cannot be made from tainted or acid milk. Clean milk is essential for cheese making, and it can only be obtained by the provision of a milking shed with an impervious floor. Milking in a muddy kraal will result in a gassy bitter cheese being produced. During the wet months the provision of a dry warm shelter for calves is essential. Exposure to inclement conditions of weather and retention of the calves in a filthy, muddy kraal will result most probably in an epidemic of white scour and ophthalmia. Commonsense treatment and commonsense housing are necessary if dairy calves are to be successfully reared.

ENTOMOLOGICAL.

Maize.—This crop is subject to the attack of stalk borer, maize beetle (*Heteronychus*), snout beetles, grasshoppers, crickets, etc. See *Agricultural Journal*, April, 1919. Maize planted after the first of the year is extremely liable to almost complete failure as a crop from the second brood of the stalk borer. See *Agricultural Journal*, December, 1917. This is of less importance in regard to ensilage.

Tobacco.—Most of the pests of this crop are active during January, *e.g.*, stem borer, leaf miner, "wireworms," surface beetles, large crickets, grasshoppers, etc. See *Agricultural Journal*, December, 1919, February, 1920.

Potato.—Certain ladybirds are apt to defoliate the young potato plants of the main crop, especially on farms where early potatoes are also grown. See *Agricultural Journal*, October, 1913. Blue blister beetles are apt to be injurious on sandy soils, and may be checked by spraying with arsenate of lead 1 lb. to 12 gallons of water. Spraying should be commenced for early blight. See *Agricultural Journal*, August, 1913.

Cabbage Family.—Plants of this family are subject to the attacks of webworm and sawfly in January. See *Agricultural Journal*, February, 1914, April, 1910, April, 1917, June, 1918.

Beans and Cowpeas.—These suffer chiefly from stem maggot. See *Agricultural Journal*, April, 1913. On small plots aphis may be checked by spraying with tobacco wash or paraffin emulsion.

Melon Family.—The chief pests in January are leaf-eating beetles. Spray with an arsenical wash or cover young plants.

Citrus Trees.—The fruit is subject to the attack of citrus codling. Collect and destroy the infested fruits. For this and other citrus pests see *Agricultural Journal*, February, 1916.

Deciduous Fruits.—These are all subject to the attack of fruit-eating beetles. See "Chafer Beetles," *Agricultural Journal*, December, 1914. Fruit moths are injurious during this month, the only preventive measure being to net the trees. For fruit fly remedies, see *Agricultural Journal*, August, 1911.

Fig.—The adult beetles of the fig borer are to be found on the young shoots. They should be destroyed. The grubs in the stems may be killed with a little carbon di-sulphide.

Mosquitoes, House Flies, Stable Flies.—See under previous month.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or failing that, on a dull day, or late in the afternoons.

POULTRY.

Many of the young pullets should be laying now. Be careful they do not steal their nests. Give them a comfortable house, and lay the nests in a quiet, fairly dark place, with sweet clean grass in them, and the birds will take to these readily. All the young cockerels except the very best should by now be off the farm, *i.e.*, disposed of for eating. This means a big difference in the profits, for if kept on, they are eating and so wasting food, taking up time the poultry keeper could profitably use otherwise, worrying the pullets with the result of less eggs, tainting the ground and occupying room in the houses to no purpose. They probably also cause overcrowding, which is one of the worst things possible in connection with poultry keeping.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of half a pound of maize per ewe will keep them in condition and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully, and select typical, uniform plants for producing seed for next season's crop.

VEGETABLE GARDEN.

Turnips, carrots, cabbage, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

VETERINARY.

Horsesickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, seven-and-a-half in the north, and less as one travels westwards or southwards. At this time of year the rainfall tends to be heavier in the eastern than in the western portions of the Territory, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

Weather Bureau.

RAINFALL.

STATION.	1920.		Seasonal to date.
	September	October.	
MASHONALAND—			
Charter—			
Buhera	...	2·01	2·01
Bushy Park	...	3·11	3·11
Enkeldoorn Gaol	0·06	2·22	2·28
Marshbrook	...	0·99	0·99
Range	...	1·79	—
Riversdale	...	1·08	1·08
Umniati	...	0·98	0·98
Vrede	...	2·08	2·08
Wylde Grove	0·04	3·60	3·65
Chibi—			
Chibi	...	—	—
Lundy River	0·17	2·09	2·26
M'Rumi	—	1·14	—
Mwanezi	0·05	1·93	2·00
Nuanetsi Ranche	...	2·09	2·26
Chilimanzi—			
Central Estates	—	2·08	—
Chilimanzi	0·30	1·37	1·74
Driefontein	...	0·86	0·87
Felixburg	...	1·70	1·70
Grootfontein	0·17	2·26	2·43
Induna Farm	...	1·41	1·47
Darwin—			
Mount Darwin	...	0·68	0·70
Gutu—			
Chingombe	0·30	—	—
Eagle's Nest Ranche	...	1·56	1·61
Gutu	...	2·37	2·37
Glenary	...	1·36	1·39
M'vimvi Ranche	...	1·18	1·18
Noeldale	...	2·77	2·77
Hartley—			
Ardgowan	...	3·04	3·04
Beatrice (B.S.A.P.)	0·03	1·13	1·16
Carnock Farm	...	1·22	1·27
Cringleford	...	0·63	1·38
Elvington	...	1·16	1·16
Gatooma	...	1·44	1·44
Gatooma (Railway)	...	0·97	0·97
Gowerlands	...	1·78	1·78

RAINFALL—(*Continued*).

STATION	1920.		Seasonal to date.
	September	October	
MASHONALAND—(Continued)			
Hartley—continued			
Hallingbury	...	1·91	1·91
Hartley Gaol	...	1·91	1·91
Hopewell	...	1·04	1·04
Jenkinstown	—	1·13	—
Ranwick	...	2·38	2·38
Spitz Kop	...	1·73	1·73
Umsweswe	—	2·11	—
Inyanga—			
Inyanga	...	2·88	2·88
Rhodes' Estate	...	3·14	3·14
St. Trias' Hill	...	2·90	3·05
York Farm	—	2·97	—
Lomagundi—			
Argyle	...	1·11	1·18
Darwendale	...	1·42	1·51
Duxbury Farm	...	0·89	0·89
Gambuli (Mukore)	...	2·28	2·28
Lone Cow Estate	...	—	—
Mvaumvi	0·01	—	—
Miranda Juta	0·11	1·21	1·32
Mukwe River Ranch	0·09	0·57	0·68
Palm Tree Farm	...	1·17	1·17
Sinoia	...	0·98	0·98
Sipolilo	...	...	...
Talfourd	...	0·88	0·88
Tmpingi	—	0·95	—
Makoni—			
Carlow Farm	—	0·83	—
Chitoria	...	1·31	1·31
Craigendoran	0·05	2·49	2·54
Eagle's Nest Ranche	...	0·34	0·34
Forest Hill	...	2·21	2·21
Gorubi Springs	...	0·98	0·98
Mona	...	—	—
Monte Cassino Mission	...	1·41	1·78
Rusape	—	2·79	—
Springs	...	1·78	1·78
Wensleydale	—	0·83	—
Marandellas—			
Bonongwe	...	1·10	1·10
Delta	...	0·76	0·76
Land Settlement Farm	...	1·09	1·09
Lendy Estate	...	0·52	0·52
Marandellas	...	0·61	0·99
Nelson	...	1·66	1·66
Tondu	...	1·00	1·00
Tweedjan	...	0·95	0·95
Mazoe—			
Benridge	...	0·13	0·19
Bindura	...	0·14	0·23

RAINFALL *(Continued).*

STATION	1920.		Seasonal to date.
	September	October	
MASHONALAND—(Continued)			
Mazoe—Continued			
Ceres	—	0·24	—
Citrus Estate	...	—	—
Craigengower	...	—	—
Kilmer	...	—	—
Kingston	...	0·24	0·25
Mazoe	...	2·30	2·35
Mazoe Dam	...	1·40	1·63
Mguta Valley	—	0·80	—
Omeath	...	—	—
Ruia	...	0·29	0·29
Ruoko Ranche	...	0·76	0·79
Stanley Kop	...	0·39	0·39
Sunnyside	...	0·65	0·65
Teign	...	0·50	0·62
Virginia	—	0·34	—
Volynia Ranche	...	0·10	0·10
Woodlands	...	—	—
Melsetter—			
Brackenburg	...	3·60	4·21
Chitora	0·06	3·59	3·65
Chipinga	...	2·16	2·52
Helvetia	0·73	3·47	5·69
Melsetter	0·06	—	—
Mount Selinda	0·50	6·05	7·98
Tom's Hope	0·35	2·89	3·45
Vermont	0·93	—	—
Mrewa—			
Mrewa	...	—	—
Selous Nek	...	1·36	1·42
Mtoko—			
Mahaka	...	1·10	1·10
Mtoko	...	0·67	0·82
Ndanga—			
Doornfontein	...	2·31	2·33
Marah Ranche	...	—	—
Ndanga	...	—	—
Salisbury—			
Ardbennie	...	—	—
Avondale	...	0·73	1·07
Botanical Experiment Station	...	0·38	0·38
Bromley	...	—	—
Chishawasha	...	0·28	0·34
Cleveland Reservoir	...	1·59	1·66
Forest Nursery	...	0·33	0·33
Glenara	...	0·78	0·78
Goromonzi	0·20	1·27	1·47
Gwebi	1·86	—	—
Hillside	—	0·84	—
Lilfordia	...	—	—
Meadows (The)	0·05	0·87	0·93

RAINFALL *(Continued).*

Station	1920.		Seasonal to date.
	September	October	
Mashonaland—(Continued)			
Salisbury—Continued.			
Salisbury (Gaol)	0·58	...	...
Salisbury (Railway)	...	—	—
Sebastopol	0·02	0·59	0·65
Selby	...	1·50	1·54
Stapleford	...	0·78	0·78
Tisbury	...	0·60	0·64
The Manor	...	0·85	0·85
Vainona	...	0·89	0·93
Umtali—			
Chiconga	—	0·97	—
Gaol	0·03	1·37	1·57
Gilmerton	—	2·24	—
Hoboken	1·61	2·90	4·20
Mukumbara	0·01	1·75	1·76
Odzani	0·32	2·23	3·60
Odzi Drift	...	0·80	0·86
Premier Estate	...	1·68	1·77
Reservoir	0·02	2·54	3·06
Sarum	...	2·23	2·25
Stapleford	0·18	5·34	7·19
St. Augustine's Mission ...	0·05	1·27	1·44
Stralsrund	...	2·06	2·45
Victoria—			
Brucehame	...	2·57	2·57
Clipsham	...	2·93	2·93
Gokomere	...	1·82	1·82
Histonhurst	...	—	—
Jichidza Mission	...	2·72	2·87
Makahori	—	1·44	1·44
Makorsi River Ranche ...	0·11	3·56	3·67
Morgenster Mission	0·05	3·76	4·05
Riverdene North	0·02	2·99	3·01
Silver Oaks	...	2·24	2·24
Summerton	...	—	—
Stanmore	...	1·52	1·52
Victoria	...	2·29	2·29
Matabeleland :			
Belingwe—			
Belingwe	...	2·82	2·82
Bickwell	...	2·30	2·30
Bubje Ranch	—	1·70	—
Sovelele	0·06	0·72	0·83
Tamba	...	1·46	1·46
Wedza	0·03	0·72	0·82
Bubi—			
Inyati	...	2·15	2·15
Maxim Hill	...	1·60	1·60
Shangani Estates	...	—	—

RAINFALL (*Continued*).

Station.	1920.		Seasonal to date.
	September	October	
MATABELELAND—Continued)			
Bulalima-Mangwe—			
Empandeni	...	—	—
Garth	...	4·74	—
Kalaka	...	0·90	0·90
Maholi	—	2·15	—
Retreat	...	0·71	0·71
Riverbank Farm	...	0·40	0·40
Solusi Mission	...	0·98	0·98
Tjankwa	...	2·15	2·15
Tjompanie...	...	0·35	0·35
Bulawayo—			
Keendale	...	1·42	1·42
Khami, Fairview Farm ...	...	2·47	2·47
Lower Rangemore	...	1·32	1·32
Observatory	...	—	—
Umgusa	...	1·36	1·36
Gwanda—			
Gwanda (Gaol)	...	2·24	2·24
Lamulas	...	1·64	1·65
Langalanga	...	1·29	1·31
Mahalali	...	1·41	1·41
Manantji	0·06	1·81	1·87
Mazunga	0·04	—	—
Mapande	0·03	1·44	1·47
Mrandas	0·08	1·05	1·13
Mtshabezi Mission	...	1·75	1·75
Tuli	...	—	—
Gwelo—			
Daisyfield	...	1·92	1·92
Dawn	...	1·26	1·26
Globe and Phœnix Mine ...	...	1·49	1·49
Gwelo (Gaol)	...	—	—
Hunter's Road	0·06	1·20	1·26
Lalapanzi (Railway)	—	1·78	—
Lover's Walk	...	—	—
Lower Gwelo	0·05	1·48	1·53
Oaklands	...	1·81	1·81
Partridge Farm	...	2·01	2·01
Rhodesdale Ranch	0·01	1·56	1·57
Riverdale	...	1·56	1·56
Sheep Run	...	3·12	3·12
Sikombela Farm	0·01	1·02	1·03
Woodendhove	...	1·55	1·55
Insiza—			
Albany	1·40	—	—
Filabusi	—	2·66	—
Fort Rixon	...	2·42	2·42
Infiningwe...	2·86	—	—
Inyezi Farm	...	0·94	0·94
Orangedale	...	—	—
Roodeheuvel	...	2·39	2·39
Thornville...	...	1·95	1·95

RAINFALL *(Continued.)*

STATION.	1920.		Seasonal to date.
	September	October	
MATABELELAND—(Continued)			
Matobo—			
Holly's Hope	...	—	—
Matopo Mission	...	1·52	1·52
Rhodes Matopo Park	...	—	—
Nyamandhlovu—			
Edwaleni	...	0·42	0·42
Naseby Farm	...	2·13	2·13
Nyamandhlovu (Railway)	—	0·85	—
Sebungwe—			
Gokwe	...	0·84	0·84
Selukwe—			
Aberfoyle Ranch	—	0·84	0·84
Rio	—	1·76	—
Selukwe (Railway)	—	1·52	—
Umzingwane—			
Essexvale	...	1·09	1·09
Hope Fountain	...	1·62	—
Wankie—			
Guyo	...	—	—
Lynwood Estate	...	—	—
Matetsi (Railway)	...	0·75	—
Ngamo (Railway)	...	0·86	0 86
Waterford	...	0·49	0·49
Wankie Hospital	0·05	0·25	0·30

... means nil.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1920	1921	
			December	January	February
Bindura	Bindura	G. Askew	11	8	12
Bromley	Bromley	C. J. Shirley	2	6	3
Charter—Mgezi	Farmers' Hall, Beatrice	W. Krienke	30	27	24
Central	Umvuma	W. A. James	25	29	26
Darwin	Darwin	H. Wessels	12	9	13
Eastern Border (South Melsetter)	Helvetia	——	10	14	11
Eastern Districts	Good Hope Farm	J. Rademeyer	11	8	12
Enterprise	Various farms	R. Philip	1	5	2
Felixburg—Gutu	Felixburg	D. R. Pyewell	..	8	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	H. Charles	4	1	5
Gatooma	Gatooma	E. Seale	18	15	19
Gazaland	Chipinga	J. Myers	27	..	..
Greystone	Various farm houses, Shangani	M. Kerr	18	15	19
Hartley	Hartley	J. de L. Nimmo	25	22	26
Headlands	Headlands	J. Grewar	No	fixed	dates
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. W. Twilley	11	8	12
Insiza—Shangani	Shangani	C. H. Lewis	18	..	19
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	11	8	12
Inyazura	Inyazura	H. B. Curling	15	19	16
Lalapansi	Lalapansi	B. J. Ingle	18	15	19
Lomagundi	Sinoia	J. G. Clarkson	18	15	19
Macheke	Macheke	W. L. McLean	No	fixed	dates
Makwiro	Makwiro	D. M. Syme	17	21	18
Makoni North	Makoni	J. G. Monckton	25	29	26
Makoni	Rusape	W. B. Tapson	11	8	12
Marandellas, Northern	Marandellas Farmers' Hall	J. Thackara	4	1	5
Marandellas, Southern	Inoro	J. Gibberd	1	5	2
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	1	5	2
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed	dates
Matopo Branch, R.L. and F.A.	Various farm houses	S. Gillespie	No	fixed	dates
Mazoe	Glendale Siding	Mrs. Yoxall West	8	12	9
Melsetter (North)	Various farms	R. Wodehouse	..	5	..
Midlands Farmers and Stockowners	———	——	10	14	11
Northern Umtali	Farm Summerfield	A. Tulloch	..	29	..
Norton and District	Norton Store	W. Wrench	4	1	5
Que Que	Que Que	E. J. Ross	18	15	19
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	30	27	24
Selous	Various farms	A. L. Douglas	18	15	19
Selukwe	Selukwe	E. E. Somerset	No	fixed	dates
Shamva	Shamva	Capt. N. Stanley Stallard	..	12	..
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	11	15	12
Umtali	Royal Hotel, Umtali	J. S. Holland	2	6	3
Victoria	Victoria	——	3	7	4
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	11	8	12

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Trees and Shrubs for Sale

The following trees and shrubs are now available for sale at the Forest Nursery, Salisbury:—

December, 1920.

Evergreen Trees (25 *in a tin*).

Callitris calcarata—The Black Pine.
,, robusta—White Cypress Pine.
Castanospermum australe—Morton Bay Chestnut
Casuarina cunninghamiana—Beefwood.
Cupressus funebris—Weeping Cypress.
,, torulosa—Himalayan Cypress.
Eucalyptus botryoides—Botryoides Gum.
,, calophylla—Calophylla Gum.
,, citriodora—Lemon-scented Gum.
,, pilularis—Blackbutt.
,, resinifera—Forest Mahogany.
,, rostrata—Red Gum.
,, saligna—The Sydney Blue Gum.
,, sideroxylon—Red Ironbark.
,, tereticornis—Forest Red Gum.
Thuya orientalis—Thuya.

Deciduous Trees (25 in a tin).

Jacaranda mimosæfolia—Jacaranda.
Phytolaca dioica—Belhambra.

Larger-sized Trees (4 in a tin).

Evergreen Trees:—
Eucalyptus saligna—The Sydney Blue Gum
Psidium pomiferum—Guava.
Photinia japonica—Loquat.

Deciduous Trees:—
Croton sylvaticus—
Jacaranda mimosæfolia—Jacaranda.
Salix babylonica—Weeping Willow.
Spathodia nilotica—

Suckers:—
Populus alba.

SHRUBS.

The shrubs are four plants in a tin; and in single tins.

Shrubs with Red Flowers or Bracts.

Euphorbia jacquiniflora	Height	4	feet
Hibiscus sinensis—Chinese Rose, double	,,	6	,,
Iochroma tubulosa—Iochroma	,,	8	,,
Poinsettia pulcherrima—Poinsettia	,,	8	,,

Shrubs with Pink Flowers.

Lagerstrœmia reginæ—Indian Crepe	,,	10	,,
Nerium oleander—Oleander, double	,,	10	,,
Salvia involucrata—Salvia	,,	3	,,

Shrubs with Mauve-Magenta Flowers.

Bauhinia sp.—Bauhinia	,,	20	,,
Bougainvillea glabra—Bougainvillea	,,	10	,,
Salvia sp.—Salvia	,,	3	,,

Shrubs with Blue Flowers.

Buddleia sp.—Buddleia	,,	6	,,
Duranta plumieri—Tree Forget-me-not	,,	10	,,
Heliotropium peruvianum—Heliotrope	,,	3	,,
Iochroma tubulosa—Iochroma	,,	8	,,
Lobelia sp.	,,	2	,,
Securidaca longipedunculata—Violet Tree	,,	15	,,

Shrubs with White Flowers.

Bauhinia sp.—Bauhinia	,,	20	,,
Gardenia florida—Katjepeering	,,	4	,,
Cratægus pyracantha—Hawthorn	,,	15	,,
Dahlia imperialis—Tree Dahlia	,,	8	,,
Hibiscus syriacus—Christmas Rose	,,	5	,,

Lantana sp.—Lantana	Height	8	feet
Ligustrum lucidum—Chinese Privet	,,	10	,,
Spirea prunifolia—Cape May	,,	4	,,

Shrubs with Yellow Flowers or Bracts.

Abutilon sp.—Chinese Lantern	,,	8	,,
,, sp.—with variegated foliage	,,	8	,,
Buddleia sp.—Buddleia	,,	10	,,
Cassia sp.—Cape Laburnum	,,	8	,,
,, abbreviata—	,,	7	,,
,, auriculata—	,,	7	,,
,, fistula—	,,	10	,,
,, sophera—	,,	7	,,
Cestrum aurantiacum—Cestrum	,,	5	,,
Holmskioldia sanguinea—Holmskioldia	,,	8	,,
Hypericum calycinum—St. John's Wurt	,,	4	,,
Poinsettia pulcherrima—Poinsettia	,,	8	,,
Streptosolon Jamesonii	,,	3	,,
Tecoma Smithii	,,	10	,,

CLIMBERS.

Aristolochia sipho—Dutchman's Pipe.
Beaumontia grandiflora—Beaumontia.
Bougainvillea glabra—Bougainvillea.
Bignonia venusta—Golden Shower.
Hedera helix—Ivy.
Jasminum grandiflorum—Climbing Jasmine.
,, sp. (with yellow flowers).
Lonicera periclymenum—Common Honeysuckle or Woodbine.
Mandevillea suaveolens—Mandevillea.
Passiflora edulis—Granadilla.
Podranea Brycei—Zimbabwe Creeper.
Solanum Wenlandii—Potato Creeper.
Wistaria sinensis—Wistaria.

HEDGE PLANTS.

The following species may be used as hedge plants:—Callitris spp., Cupressus spp., Thuya orientalis, Photinia japonica, Hibiscus sinensis, Hibiscus syriacus, Buddleia spp., Duranta Plumieri, Securidaca longipedunculata, Gardenia florida, Cratægus pyracantha, Spirea prunifolia, Ligustrum lucidum, Cestrum aurantiacum and Bougainvillea glabra.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE AND CROPS.

No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 106. Cultivation and Preparation of Ginger.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. G. Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops unsuitable to Southern Rhodesia conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.
No. 305. Manure Supplies, by E. V. Flack.
No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.
No. 320. Maize Grading, by C. Mainwaring.
No. 327. Linseed, by C. Mainwaring
No. 344. Ensilage, by J. A. T. Walters, B.A.
No. 351. Improvement of Rhodesian Pastures, by H. G. Mundy, F.L.S.
No. 357. Measurement of Land, by F. Eyles, F.L.S., F.S.S.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 368. Cotton Culture, by H. W. Taylor, B.Agr.
Botanical Specimens for Identification.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-1919, by H. G. Mundy, F.E.S., and J. A. T. Walters, B.A.
No. 363. The Manuring of Maize at Makwiro, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.

TOBACCO.

No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.
No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.
No. 333. Tobacco Culture—Field Operations, by H. W. Taylor, B.Agr.
No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 339. Tobacco Culture; Harvesting and Curing, by H. W. Taylor, B.Agr.
No. 346. Tobacco Culture—Grading on the Farm, by H. W. Taylor, B.Agr.
No. 347. Tobacco Pests of Rhodesia, by R. W. Jack, F.E.S.
Handbook of Tobacco Culture for Planters in Southern Rhodesia, price 2s. 6d., post free outside South Africa 3s. 6d.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 348. Statistics of crops grown by Europeans in Southern Rhodesia for the season 1918-19, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 163. Feeding and Care of Imported Cattle, by R. C. Simmons.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Beva Government Veterinary Bacteriologist, Southern Rhodesia.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 255. Pound Fees.
——— Arsenite Cattle Dip—How to Mix.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
No. 331. Theory and Practice of Feeding Cattle in Southern Rhodesia, Part I., by R. C. Simmons.
No. 332. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part II., by R. C. Simmons.
No. 340. Notes on Theory and Practice of Feeding Cattle in Southern Rhodesia, Part III., by R. C. Simmons.
No. 345. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part IV., by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 359. Hints on Dips and Dip Testing, by A. W. Facer, B.A.
No. 364. Round-worm Infection of Calves, by H. E. Hornby, M.R.C.V.S.

DAIRYING.

No. 184. Cream, its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 205. Home Butter Making, by R. C. Simmons.
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No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
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No. 329. Gervais Cheese, by J. B. Fisher, N.D.D.
No. 356. Cream and its Production, by T. Hamilton.
No. 370. Development of Flavour in Butter, by T. Hamilton, M.A., N.D.A., N.D.D.

VETERINARY.

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Services of Government Veterinary Surgeons.
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No. 367. Quarter-evil, by C. R. Edmonds, M.R.C.V.S.

IRRIGATION.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W M. Watt.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
No. 349. The Hydraulic Ram, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.

FORESTRY.

No. 199. Eucalypts for the Farm; by J. J. Boocock.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 315 Descriptive List of Trees and Shrubs at Forest Nursery.
No. 366. The Management of Woods, by J. S. Henkel.

HORTICULTURE.

No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 296. Citrus Nursery Work, by A. G. Turner.
No. 354. The Home Orchard, by A. G. Turner.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 147. Root Gallworm, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
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No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
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No. 219. More Household Insects, by R. Lowe Thompson, B.A.
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No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.
No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.
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No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.
No. 353. Further Experiments with Poisoned Bait on Maize Lands, by R. W. Jack, F.E.S.
No. 369. The Bean Stem Weevil, by R. W. Jack, F.E.S.

POULTRY.

No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 330. Poultry Keeping in Rhodesia—Incubation, by A. Little.
No. 335. Poultry Husbandry: The Rearing of Chicks, by A. Little.
No. 337. Poultry Diseases: Enteritis, Tuberculosis, Coccidiosis.
No. 343. Poultry Husbandry; Breeding and Selection for Increased Egg Production, by A. Little.
No. 355. Poultry Husbandry—Principles of Breeding and Mating, by A. Little.
No. 365. Poultry Husbandry: Treatment of Adult Birds, by A. Little.
No. 371. Ducks, by A. Little.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 254. Hints on Explosives, by W. M. Watt.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 358. Notes on the Regulations governing the Sale of Fertilisers and Farm Foods, by E. V. Flack.
No. 360. Notes on the Rainfall Season 1919-20 in Southern Rhodesia, by C. L. Robertson, B.Sc., A.M.I.C.E.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Pisé de Terre Buildings, by A. A. Muir.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

Position as manager on farm or ranch; life experience in all branches of farming; six years in Rhodesia prior to 1914; married; age 30; keen and energetic; available April, 1921. For further particulars, write K. G. Gunn, Wilger's Farm, Horley, Surrey, England.

Young Britisher (22 years), with farming experience, desires post as learner on Rhodesian farm; Mashonaland preferred. Willing to give services in return for board with respectable family. Write, in first instance, to E. Cathcart, Cranleigh, Newquay, Cornwall, England.

E. G. R.—Wanted by lady, opening as pupil on cattle farm where thorough tuition can be obtained. Prepared to pay monthly premium. Prefers Melsetter or Marandellas districts.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal.* This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 504 of 1920.] [1st October, 1920.

APPLICATION FOR USE OF WATER

in terms of the "Water Ordinance, 1913," *as amended by the "Water Ordinance,* 1913, *Amendment Ordinance,* 1920."

IT is hereby notified that the following application has been made for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
M. D. Fynn	Banda	Mazoe	Farm Rydal

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 480 of 1920, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 527 of 1920.] [15th October, 1920.

APPLICATIONS FOR USE OF WATER

in terms of the "Water Ordinance, 1913," *as amended by the "Water Ordinance,* 1913, *Amendment Ordinance,* 1920."

IT is hereby notified that the following applications have been made for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
W. G. Hamman ...	Little Sebakwe	Chilimanzi	Farm Mooifontein
do ...	Nyamatzanga	do	do

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 480 of 1920, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications together with a full statement of the grounds for such objections.

No. 579 of 1920.] [19th November, 1920.

APPLICATION FOR USE OF WATER

in terms of the "Water Ordinance, 1913," as amended by the "Water Ordinance, 1913, Amendment Ordinance, 1920."

IT is hereby notified that the following application has been made for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
F. W. H. Gillwald	Mpudzi	Makoni	Farm Moodiesville

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 480 of 1920, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 576 of 1920.] [19th November, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Acting Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 446 of 1920, and, in terms of section 17 of Government Notice No. 21 of 1917, declare the following areas of infection and guard area in lieu thereof :—

BULAWAYO, MATOBO AND BULALIMA-MANGWE NATIVE DISTRICTS.

(a) *Areas of Infection.*

1. An area bounded by and including the following farms : Springvale, Tati Outspan, D'Hoop, Forwards ; the eastern boundary of Forwards to the Ove River ; thence down this river to the north boundary of Ove North ; thence along the north-western boundary of Ove North, the northern boundaries of the farms Gummella, Undza, Mavuli and Store ; thence by and including Mount Edgecombe, Famookwe, Mount Francis, Warneford, Shashani, Hannayvale, Sergeants and Springvale B.

2. Sauerdale, excluding Westacre Creek, Inyanden and Chabalala Farms.

BULAWAYO, MATOBO, BULALIMA-MANGWE AND UMZINGWANE NATIVE DISTRICTS.

(b) *Guard Area.*

An area bounded by and including the following farms : Matjesumphlope, Douglasdale, Hope Fountain, Happy Valley, Glen Montagu, Inyorka, Boomerang, Merino Walk, Matopo Block, Matopo Mountains unsurveyed west of Matopo Native Reserve, Manyoni, Sibuntuli, Maleme, Alalie, Malundi, Malala, Inkezi, Rosenfels, Shashani Reserve to the north-east beacon of Semookwe Reserve, along the northern boundary of this reserve to southern beacon of Mount Pleasant, thence by and including Mount Pleasant, Guswini Reserve, Taylor's Block, Smiths, Vlakfontein, Mali, Horncastle, Greenfields, Stokestown, Hobart, Boolie, Goodluck, Stonehills, Marshlands, Wilton, Stratton, Kalanga, Elstobbs, Centenary Mission, Maritzburg, North Vreigevecht, Irene, Collaton, Wollendale Estate, Umganin and Bellevue.

No. 578 of 1920.] [19th November, 1920.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

IT is hereby notified that His Honour the Acting Administrator has, under and by virtue of the powers vested in him by sections 8 and 9 of the "Animals Diseases Consolidation Ordinance, 1904," declared that the introduction of grass, hay, forage, sugar cane, straw, lucerne hay and green lucerne from the provinces of Natal and the Transvaal, in the Union of South Africa, is prohibited unless accompanied by a certificate (in the form hereunder set out) signed by the senior veterinary officer of the district in the said province from which such introduction is intended to be made.

Government Notice No. 211 of 1909 is hereby cancelled.

Certificate.

I, the undersigned, do hereby declare the..................................grown upon the farm..........................in the district of..............................and consigned to Mr..............................of..........................Southern Rhodesia, is from an area free from African coast fever and that it is free from ticks.

Address................................

....

Date............................

....

Senior Veterinary Officer.

CATTLE CLEANSING ORDINANCE, 1918.

IT is hereby notified that "Champion Liquid Sodium Arsenite" in the dilution of one gallon to 400 gallons of water now conforms to the standard strength of an effective tick-destroying agent laid down by the "Cattle Cleansing Ordinance, 1918."

Government Notice dated 13th August, 1919, shewing that a dilution of 1 in 500 conforms with the regulations of the "Cattle Cleansing Ordinance, 1918," is hereby cancelled.

5th November, 1920.

IMPORTATION OF TICK-INFESTED ANIMALS.

NOTICE is hereby given that cattle or other animals introduced into Southern Rhodesia in a tick-infested condition will be dealt with under the provisions of the Animals Diseases Consolidation Ordinance, and that the owners of such animals will be prosecuted.

RHODESIA

Agricultural Journal.

ISSUED BY

The Department of Agriculture,

SALISBURY, RHODESIA.

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The Journal is issued every alternate month.

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A discount of 10 per cent. will be allowed for standing or consecutive advertisements running through six issues. Remittances, and electros where desired, should accompany orders. The right is reserved to discontinue the insertion of standing or consecutive advertisements should payment beyond the second issue be delayed.

The right of approval of all advertisements by the Director of Agriculture is reserved, and his decision as to the acceptance or rejection is final.

An additional charge may be made for advertisements printed in special type, equal to any additional charges made by the printers for setting up same.

Advertisements will be accepted from *bona fide* farmers wishing to effect sale, purchase or exchange of produce, live stock or farm implements, at a minimum charge of 2/6 per insertion of 20 words. Extra words will be charged for at the rate of 1/- for every 10 words.